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Prosperity in Lead Mining

THAT 1925 was a prosperous year for non-ferrous metal mining companies, particularly those producing large quantities of lead, is not news. But that ten leading producers of lead ore in North America, *without exception*, established new high records as to net earnings for their entire history is not so generally known. The fact is certainly extraordinary. There is but one conclusive test by which to measure the degree of prosperity, and that is net profits—money in bank or in stockholders' pockets. The accompanying table shows the net earnings after deducting depreciation and taxes, but not sums allocated to depletion reserve, as they appear in the current annual reports. The Consolidated Mining & Smelting Co., of Canada, netted $4,859,069 in 1924; and $11,215,316 in 1925, or 88.4 per cent of the capital as appears on the balance sheet. This is the most remarkable increase shown.

Name of Company	Net Profits, After Depreciation and Taxes	Dividends Jan. 31, 1925, to Jan 31, 1926
St. Joseph Lead	$14,355,306.79	$5,745,098
Consolidated M. & S.	11,215,316.00	3,100,955
Federal M. & S.	3,450,430.57	839,034
Bunker Hill	3,415,092.43	2,959,209
Tintic Standard	3,022,986.76	1,959,955
Hecla Mining	2,994,717.47	2,000,000
Silver King Coalition	2,215,806.36	1,276,905
Park-Utah Consolidated	1,912,273.68	1,001,200
Ahumada-Eurpcion	1,696,144.44	1,789,518
Utah-Apex	1,054,762.02	686,660

In general, an average price for domestic lead of 9.02c. per pound in New York probably was the most important factor in these exceptional showings. Likewise the satisfactory prices for zinc and silver, one or the other or both of which are important products of all but St. Joseph Lead, helped. Still another important factor is improved concentrating practice. Selective flotation of lead-zinc ores plays a leading part in the operations of the Consolidated M. & S., Federal M. & S., Park City Consolidated, and Utah-Apex companies; and flotation of some kind is practiced by all but Tintic Standard and Ahumada-Erupcion companies. Progress in the art has effected a big increase in the profits from a given ore in many instances. Moreover, the steady increase in the efficiency of all mining, milling, and smelting operations, accompanied by the use of improved machinery and equipment, is being reflected in lower operating costs and in consequently increased profits. Still another factor is the higher rate of production by many of the companies, new records being made by St. Joseph Lead, Consolidated M. & S., Silver King Coalition, Ahumada-Erupcion, and Utah-Apex; and in some particulars by the others.

The outlook is excellent for most of the companies included in this list; but intelligent administrators recognize the possibility of lower prices for metals and lesser profits. The earnings of the St. Joseph Lead Co. depend in a larger measure than any other on the price of lead, so that the comment of C. H. Crane, president of that company, in the recent annual report, may be viewed as not so pertinent to the operations of the others, and in any event as very conservative. It is worth careful consideration, however, and is quoted here with no thought of throwing cold water on the hopes of shareholders of companies mining lead. Mr. Crane says:

> "The year 1925 has been a record year in the history of the company. The largest production, the largest sales coincident with the highest price ever received for its product, have resulted in a record of earnings. Stockholders will be unwise to regard a year like 1925 as anything but exceptional. The market price of lead has been out of line with other basic commodities, and history teaches us that such conditions cure themselves and a wise man does not count on their continuance."

From the showing made during 1925, however, a measurable decline in metal prices will not wipe out margins of profit; and if prices rule reasonably close to their present levels, continued gratifying earnings seem assured.

Selective and Differential Flotation

FLOTATION has undergone a radical development in the last two or three years. The process is now commonly applied in three distinct ways: first, floating all the metalliferous minerals and rejecting the gangue in the tailing; second, floating the valuable mineral or minerals, as chalcocite, and rejecting any waste metalliferous mineral, with the gangue; and third, floating two or more valuable minerals in successive stages, as galena, then blende, and rejecting the gangue with as much of the worthless metalliferous minerals as possible, in the tailing. These variations in procedure have come into being only in the last few years, and apparently no effort has been made to adopt a distinguishing terminology. The first class of work is popularly known as ordinary or straight flotation, and the second and third classes are variously labeled preferential, differential, or selective flotation, oftentimes the same work being described by more than one of these terms by the same person.

It would seem well, therefore, to adopt a standard terminology so that one may speak and write precisely. It is accordingly suggested that differential flotation be applied exclusively to the process in which only one concentrate is made and in which other flotable minerals are depressed with the gangue; and that when more than one concentrate is made, the process be known as selective flotation. The decision of *Engineering and Mining Journal-Press* to do this is largely an arbitrary one, and we shall be pleased to hear from any of our readers who may have objections to offer. Until some good reason is offered why the distinction is undesirable, we shall henceforth make it in our columns, and suggest that it be adopted by technicians generally.

Government Research in Electrical Prospecting

SUFFICIENT SUCCESS has been had in detecting hidden mineral deposits with electrical prospecting instruments to warrant government research in this direction, the new Director of the Bureau of Mines, Scott Turner, is reported to believe. The principles underlying these devices, he thinks, should be studied more carefully before any effort is made to perfect them individually.

It is probably true that some exponents of the science of geophysical prospecting have been rather one-sided in using or advocating the use of only certain methods and instruments, these being the ones with which they are most familiar. This is quite natural, especially where the methods and instruments have given promising results, and still more natural where the person using a certain instrument is an agent directly or indirectly of the company that manufactures it.

There are therefore two good reasons why the Bureau should undertake this research: first, to aid in the development of the science for its own sake; and, second, to stimulate among American companies a greater interest in the science, which up to the present has experienced its principal development abroad. Moreover, while the bureau is on the subject, it might give a thought to the divining rod and "doodle bug," by which morons and swindlers at times claim to find ore, and to combat which today is all the more difficult because of the development of legitimate geophysical instruments and methods.

The Climate of Southern California

WONDERFUL OPPORTUNITIES for buying marvelous stock in incredibly rich mines increase rather than diminish—especially, it would appear, in Los Angeles, which a correspondent recently referred to as the "Nut center of the United States." Evidently the squirrels are busy there. Not only of unprecedented glory are the advertisements of the Western Lead Co., to which we have given some otherwise undeserved editorial publicity, but other specimens of other scintillating advertisements of get-rich-quick stock in limitless mines are coming to hand. Such is the advertisement in the *Los Angeles Examiner* (which, like the other Los Angeles papers, seems to be out for the long green, regardless of Better Business Bureaus) of the Big Cliff Copper Mine, put out by L. B. Longnecker & Co., of Los Angeles.

The Big Cliff Copper Mine, it would appear, is a world-beater—and a betting favorite in the same class with Western Lead, which, even though it can afford to buy more advertising space in the Los Angeles press, can hardly hope to do more than match stories with the less money-flush Big Cliff Copper. The promoters of the Big Cliff Copper Mine have an ingenious and convincing argument. It starts like this as we may paraphrase it: "Say, you've heard of the Anaconda Copper Mine, haven't you?" The nut, proud of his intelligence, assents. "Well, do you know that the Anaconda has paid $360,128,996 dividends?" Nut wasn't sure he knew about the $966. "Well, now! the Walker mine is in Plumas County, California, on the California Copper belt; and is controlled by the Anaconda!" Nut begins to loosen his hold on the limb. "Now prepare for the big surprise: the Big Cliff Copper Mine is in the same Copper Belt as the Walker. You've learned in school, Mr. Hazel, or Wall, or Butter, as the case may be, that things equal to the same thing, etc.—haven't you now?" "Sure," says the nut, confident once more. "Well, then, you see: Big Cliff is as good as the Walker—in fact our engineers confirm this simple bit of logic." Quoting from the ad: "The reports of several recognized mining engineers lead us to believe the future possibilities of this property are every bit as good as the Walker mine referred to above." "Now, Mr. Butter, continuing: Since the Big Cliff is as good as the Walker and the Walker is controlled by the Anaconda, which has paid 360 million, 128 thousand, *and* 966 dollars in dividends, why, then, and to be sure, the Big Cliff must pay at least as much." The nut loses his hold on the branch and the squirrel has him.

For the notebook of the mining engineer we may add that the "Big Cliff Mine has estimated ore reserves in excess of $1,000,000 without attacking ore in place." As to the said ore in place, the promoters are mum. After all, why worry about ore in place when Los Angeles is such a convenient mining center!

Our correspondent writes that "the blue-sky law is a dead failure so far as this state is concerned. The only man affected by it is the legitimate promoter."

A Worth-While Star

THOSE WHO HAVE READ in these pages of the efforts to locate the meteor that is supposed to have caused the great crater in the Arizona desert near Cañon Diablo—especially the letter of Daniel Moreau Barringer in the issue of Jan. 9, 1926, and the editorial in the issue of Dec. 26, 1925—may have formed their own ideas as to how the crater was formed. Whatever be the theory of its origin and however strong the evidence may be that a meteor was responsible, the fact is that no spectacular discovery has been made to date. Mr. Barringer says that a drill hole put down by the Crater Mining Co. "encountered what is beyond doubt the upper part of the buried cluster of iron meteorites, finding it in exactly the predicted position. The work of the company, therefore, though it was unsuccessful in mining the meteoric mass, was successful in locating the hidden meteor and in pointing the way for future exploration." This is the strongest statement that he ventures in the letter referred to.

It is startling, therefore, to read in the *Santa Fe Magazine* for March, under the caption "The Eighth Wonder of the World," an article credited to the *American Weekly Magazine* that proclaims in most sensational language that a "monster meteor of iron, liberally mixed with diamonds and precious metals of priceless value" has been found beneath the crater's rim. "Think of a meteor more than 500 ft. in diameter and weighing 12,000,000 tons," it says. "It was finally reached by driving an inclined tunnel from some distance outside the east rim, westward and downward at an angle of 45 degrees. The tunnel, a thousand feet long, came upon the giant meteor at a depth of about 500 ft. . . . It is going to be a big job to break the mass into removable fragments. This is likely to be accomplished by sawing, rather than by high explosives. But in the meantime the meteor must be exposed to view and

rendered accessible by mining. How, it may be asked, can the job pay, taking the difficulties into view?"

How, indeed? "Ah! there lies the most important point of the story," says the raconteur. It is known with certainty, he continues, that the meteor contains three-fourths of an ounce of platinum to the ton. Twelve million tons of meteor contains therefore nine million ounces of platinum, which at a market price of $115 per ounce is worth over a billion dollars. Aye, there's the reason! The diamonds and other priceless minerals may be ignored.

"A worth-while star indeed," the article concludes. "Although a small one, rich. How wonderful that such a mass of wealth should be sent to us by an accidental shot out of the cold of cosmic space!"

White Metal Goes on Forever

THE MYSTERIOUS "WHITE METAL" of Nevada and of California, east of the Sierras, and also of some contiguous states, has entailed no little wise conferring, more or less entertainment, considerable laboratory investigation, and numerous letters, as well as the crushing of fond hopes that it would eventually be discovered, correctly named, and ensconced in some museum where, with its fingers in its vest pits, it would smile broadly at those curious enough to pause and look closely at the contents of the cases. Only quite recently Mr. C. W. Davis, of the Bureau of Mines, advanced the results of his investigation of this will-o'-the-wisp of the West, but, although his is a scholarly account of an unsuccessful attempt to find the white metal and an explanation of the phenomena from which the presence of this metal was erroneously inferred, it is feared that many of the old white-metal fans and the metallurgists of the blacksmith forge will not be convinced, and that like John Brown's soul, this mysterious white metal will go marching on and on, smirking at the scientist and plaguing the pseudo investigators.

A Few Things Yet to Be Discovered

JUST WHEN IT SEEMS that improvements in milling have gone about as far as they can, something new comes along to increase the already high efficiency of ore concentration processes. At the recent A.I.M.E. meeting in New York it was remarked that recoveries were now getting so close to 100 per cent in many plants that not much more could be expected. However, it must also be remembered that there is plenty of room for reduction of costs, all the way from a few dollars a ton down to a few cents. When the millennium arrives, recoveries will be 100 per cent at no cost whatever, and we might just as well prepare for this condition so far as possible.

Present thoughts on this subject are inspired by the success of the Forrester flotation machine in tests at two or three Southwestern plants. This machine was described by the inventor in the Sept. 26, 1925, issue of *Engineering and Mining Journal-Press;* further work has emphasized its advantages. No porous mats are used, the air being introduced into the bottom of the cells by small open-ended pipes suspended from an air-main above. As a result, air at only 1½ lb. pressure is necessary, instead of at 4 to 5 lb., or even more sometimes when the mats become encrusted. This makes an enormous saving in power, especially in view of the fact that an even less volume of air seems to be required. Metallurgically, results are about the same, but the cell is foolproof and has no wearing parts. The entire Morenci mill is probably, by this time, equipped with these machines, according to reports.

Xanthate, wonderful as it is, is also perhaps not to reign alone at the head of the legion of flotation reagents, for other substances, now being developed, may, in time, take its place. The possibilities of cyanide are only beginning to be realized in the realm of selective flotation, though this chemical has long been used in the extraction of gold and silver. The process of sulphidation and subsequent flotation of oxidized ores is also being much improved.

Wanted: Names of Buyers of Minerals and Ores

LISTS OF BUYERS of various metallic ores and non-metallic minerals seem to be in great demand, judging by the number of such inquiries that reach the editorial offices of *Engineering and Mining Journal-Press.* A miner's first interest, of course, is in finding an ore deposit, but the next thing is often to find a buyer for what it produces. This is not so difficult usually in a metal-mining district, where the custom mills and smelters are well known and usually fairly accessible; in fact, the miner is often approached by several ore buyers and can have a choice of contracts. But when an uncommon ore is found, or the miner is in an out-of-the-way place, he is often at a loss to know whether his deposit has any commercial value and where to turn for a market.

This seems to offer a good opportunity for some one to compile accurate and complete lists of buyers of the various minerals. *Engineering and Mining Journal-Press* has done what it could to assist its subscribers in this direction, and has published many articles on marketing, but no pretense is made to supply complete lists of buyers for all of the various minerals in which its readers are interested. This would seem to be something the U. S. Geological Survey might well do in connection with its annual reports on Mineral Resources. In fact, some of those who compile the individual chapters of these reports, covering certain minerals, have already done just this thing. J. M. Hill, for example, compiled and published a list of all the users of bauxite in the United States, and also the producers, which lists are certainly valuable to any one interested in the market, either from the producing or consuming branch. Would it not be a good idea, therefore, for the Survey to instruct its contributors to "Mineral Resources" to make it a point to include the names of buyers of the specialty on which they report, possibly also giving the names of sellers where the list is sufficiently limited, so as to admit of easy compilation. The names would be brought up to date each year as the annual chapters are compiled. The list would preferably include brokers as well as ultimate consumers, and the names of foreign buyers might be given in some instances where the domestic market is limited or non-existent, as is the case for tin, antimony, cobalt and nickel ores, for example.

Engineers of Note

Robert Randolph Bruce

IT WAS in the early summer of 1887 that Robert Randolph Bruce, a young civil engineer from Scotland, arrived in New York determined to try his fortunes in America. He had about forty dollars, and today he stands possessed of the highest honor which lies in the power of the Federal Government of Canada to give to a person, that of Lieutenant Governor of a province —British Columbia. Robert Randolph Bruce, C.E., B.Sc., F.R.G.S., was born at Glenrinnes, in the county of Aberdeenshire, Scotland, one of the children of the Rev. Charles Bruce, a Presbyterian clergyman. The stipend of a minister was not large, so beyond being able to afford him a good home training, both in religion and the responsibilities of life, there was little that the Reverend Mr. Bruce could afford to the several members of his family. Robert had to depend on his own exertions for any education beyond what was afforded in the village school. Young Bruce determined to fit himself with the best education that Scotland could afford. He worked during the long holiday period with Messrs. Denny's, shipbuilding engineers, at Dumbarton. He earned money by acting as a tutor and coach to other students during the term in the University of Glasgow. After graduating, he continued with Messrs. Denny's, but later, hearing of the great development in western America, he determined that there were better opportunities for a man of his class out here. This was what brought him to New York in search of employment in 1887. He had a letter of introduction to Thomas G. Shaughnessey, then manager of the Canadian Pacific Railway Co. at Montreal. When he appeared before this keen judge of character arrayed in a top hat and a frock coat he was surprised to find Shaughnessey working in his shirt sleeves. However, they soon came to an understanding of appreciation which resulted in Bruce's immediate employment as an engineer in the construction branch, but which also resulted in what was more important, the bond of fellowship which is formed between men of the same industrious character. After working on various divisions Bruce was transferred to the construction of the Crow's Nest Pass branch of the Canadian Pacific Railway. It was while working in this field that he first took up seriously mining engineering. The largest ore-mining boom that British Columbia has ever experienced was just starting; the deposits of bituminous coal near Fernie were about to be developed, and extensions on railways seemed due to have a lull. Bruce, in 1895, entered McGill University, Montreal, where he took a course in mining. He later joined Thomas White, C.E., in establishing a stamp mill on Perrier Creek, near Fort Steele, south of the Windermere district, British Columbia. After making an examination of the Windermere district and touring most of the interior Bruce made a working arrangement with the late Herbert Carlyle Hammond, a broker and man of means of Toronto, for the development of mining interests. While mining was still active he gave his attention to town planning and laid out a large addition to the townsite of Wilmer. To benefit the district he had a government agent appointed, persuaded the federal government to build a telegraph line and appoint an agent so that the district would be in touch with the outside world, and then, largely as promoter and founder, laid the foundation for such local organizations as the Farmers Institute, the public school, the hospital, and the Board of Trade. He continues in every way to be a generous supporter of all the local organizations and institutions of the city in which he lives, and is a lover and supporter of all forms of art. To the Great War Veterans he has presented a comfortable artistic memorial lodge. His home near Invermere is the charming center of many local gatherings.

ROBERT RANDOLPH BRUCE

For many years most of Bruce's spare time has been spent abroad. In the early part of 1914 he married Lady Elizabeth Northcote, the second daughter of the Earl and Countess of Iddesleigh, at the family home residence at Upton Pyne, Devon. After a married life of but a little over a year Lady Bruce died, leaving no children. He recently returned from a visit to England and his home in Scotland and assumed his new duties early in March.

A Successful Gold Dredging Enterprise in Guatemala

Production Proves Extreme Reliability of Drill Sampling—Yield 21.24c. per Cubic Yard; Operating Cost 9.26c.

By A. C. Ludlum
President, Guatemala Gold Dredging Co.

A. C. Ludlum

INDUSTRIAL or commercial enterprises are generally supposed to give a moderate but sure return on the investment; whereas, a popular conception of mining enterprises is one of fabulous return or else nothing at all. In other words, a gamble where luck and chance govern all. The dredging of gold upsets this conception; such mining can be made as much a business enterprise as any manufacturing industry, and in addition it has the advantage of having an unlimited and unfluctuating market for it product. One variable is eliminated.

Necessity for Accurate Prospecting

The first step in developing a successful gold-dredging property is to have the ground thoroughly prospected. The importance of proper prospecting cannot be too strongly emphasized, and it should be entrusted only to those who are competent and capable in this specialized work. Usually the procedure is to have a preliminary examination made by a competent engineer, and if preliminary data indicate a probability of developing a profitable venture, the examination is made. This can usually be most economically done by drilling. The entire area can be prospected and payable areas outlined before deciding on the equipment of the property. Time and money judiciously spent in this preliminary investigation will prove most profitable in the long run, and after this work has been properly done and the property equipped with a skillfully designed and well-built dredge, the returns can be predicted with an exactness that challenges belief. In the particular operation described in this article each month's gold production can be predicted from the drill sheets with extreme accuracy.

Labor Supply Secondary Problem

Assuming the placer mine has been located and the entire dredging area carefully prospected and all conditions predetermined, it then remains to apply good engineering in the design and erection of the dredge and efficient management to maintain it in operation. The management is not difficult, as only a few men are required in gold dredging; usually about ten men constitute the dredge operating crew, with five or ten men for shore duty. This is a remarkably small amount of labor, especially when compared with the immense tonnage handled per day, frequently as high as 15,000 tons of gravel, on some of the larger dredges.

Following is a brief history of a successful gold-dredging enterprise, the Guatemala Gold Dredging Co. of Guatemala, Central America, which was started and brought to a successful fruition under my direction.

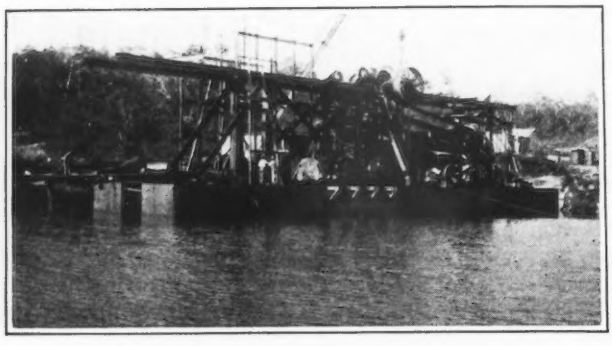
The company's property is located at Quebradas, in Guatemala. The seaport is Puerto Barrios, which is the main port of entry on the Atlantic Coast, and the mine is situated about fifty miles west of the port. A branch of the International Railway Co. of Central America runs from the seaport to the mine, thus reducing the transportation problem to a comparatively simple one. In fact, this was one of the favorable features that led to the taking up of the enterprise. This is the first gold dredge installed in Central America, and the heavy production of this dredge during the last year has led me to conduct extensive exploration operations in the hope of finding more dredging property in this promising section of country. The company's property consists of 300 acres of auriferous gravel. An 8-cu.ft. all-steel electrically driven dredge was installed, and a hydro-electric power plant was also built for furnishing power for the operation of the dredge. Houses for the white men and their families, together with modern camp equipment and accessories, all had to be built, and required a total investment of about $375,000.

Old Hydraulic Operations Unprofitable

This property originally came to my attention about fifteens years ago, when it was known as the Potts & Knight concession. The ground was examined by Henry F. Le Fevre, who centered his attention on the benches, which were found to be rich in gold, though the bottom land was not considered good enough at that time for exploitation. Theodore N. Vail, who was then president of the New York Telephone Co., took hold of the property and equipped it for hydraulicking the benches. After spending large sums of money with very little return, it was decided to equip the property with a gold dredge.

In the meantime Mr. Vail had died and his executors decided to place the property on the market; and accordingly the Hammon Engineering Co. was engaged to prospect and drill the property. The results of its work was submitted to many intended purchasers and finally to me. I decided to make a thorough investigation of the project, and accordingly in 1922 an expedition was sent down to check up the former report and to further prospect the property. This prospecting work was done by the Ludlum Engineering Co., which is a subsidiary of the New York Engineering Co., which furnished the plant for the equipment of the property. Edward F. Wilson, in charge of this work, had two Empire drills, with which he completed the task in the fall of 1923.

I followed a rather unusual method in doing the prospecting. I had the driller send the gold to our New York office just as it was recovered from each hole, together with all data of the hole itself, including a complete description of the different kinds of materials



The dredge in course of construction

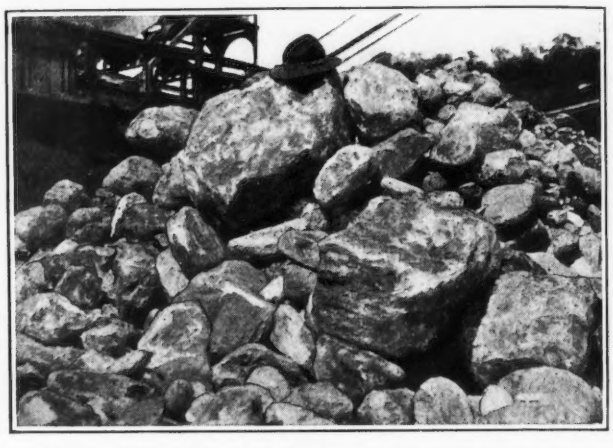
passed through and the footage of each. From these data we determined the drilling factor for each individual hole, varying it according to the nature of the ground, and also checking it occasionally by having the actual amount of ground recovered from the hole measured by the driller. In this drilling I determined the values to be considerably higher than those given by the Hammon Engineering Co. in the work done by them for Mr. Vail, and the proven area was somewhat enlarged.

Mr. Wilson drilled eighty-three holes, most of which served as check holes on the former drilling records. At the conclusion of this work it was decided that the property was well worth exploitation and the designing of the dredge and power plant was begun. Erection of the dredge was started early in January, 1924, and the entire plant was completed and put into operation on Nov. 1, 1924.

Power Plant Construction

Dredging results, during the last twelve months of operation, have proved the drill calculations to have been extremely accurate. The installation of the dredge proved to be a comparatively simple affair, but the building of the power plant was quite difficult. A line had been surveyed for the ditch and pipe line for the power plant some years ago, and it was generally supposed that this was the most direct and feasible line, but investigation proved that this location of the ditch and pipe line would provide a head of only 70 ft. for power, and with the minimum flow of 52 cu.ft. of water in the dry season, this would not develop sufficient power for our requirements. Therefore, it became necessary to establish a new ditch and pipe line, which gave us a head of 80 ft., thereby providing ample power during the one or two months of the dry season in the spring.

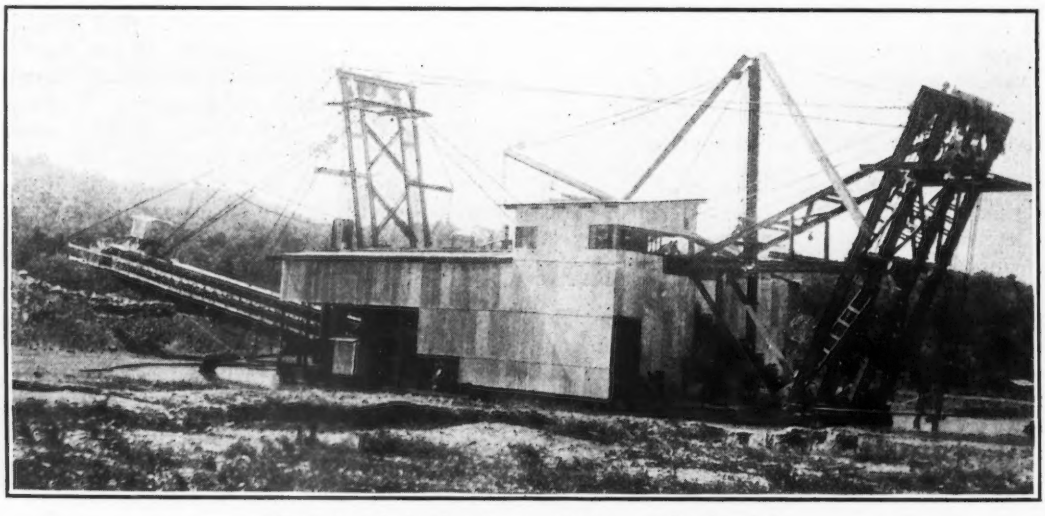
The ditch is 11 ft. wide at the top, 7 ft. wide at the bottom, 3 ft. deep, and about 2,800 ft. long. A 5-ft. steel pipe was installed for the remainder of the distance, about 2,400 ft. This steel pipe passes through a tunnel which was excavated in gravel for a distance of 160 ft., and the driving of this tunnel and installing the pipe caused considerable trouble and expense, due to the heavy torrential rains. These caused many washouts in the line and cave-ins in the tunnel. In fact, the rains added greatly to the cost of the ditch line itself, as well as for the other work.



Boulders handled by the dredge. The presence of these delayed operations and cut the yardage somewhat

The power plant consists of a 600-hp. hydraulic turbine direct-connected to a 500-kw. generator. Alternating current was generated at 2,300 volts, and transmitted one mile to the dredge, where it was stepped down by transformers on board the dredge to 440 volts for operating the various motors used.

Dredge construction proceeded smoothly, the steel hull having been fabricated in its entirety on the ground. The usual equipment of derrick, hoisting en-



Completed dredge in operation at Quebradas

gines and air compressor, was all sent down in advance, and a temporary power plant was installed to furnish the motive power. This temporary plant utilized an old hydraulic mining pipe line with a 200-ft. head. A waterwheel of the impulse type developing 125 hp. was designed and built by the New York Engineering Co., because of the fact that it was impossible to secure a wheel from any waterwheel manufacturer in less than three months. This wheel was turned out in three weeks' time, and the erection plant was ready for operation when the first dredge material arrived on the ground.

All this material was shipped by ocean freight to Puerto Barrios; from there it was loaded on to the railroad and transported directly to the dredge-building site. Distribution was effected through tractors and trucks. It was necessary to haul the power-plant apparatus one mile from the railroad station to the power-house site, and a road was constructed for this purpose. All the work was largely accomplished with native labor, supervised directly by my own engineering staff, headed by A. H. Clements. Mr. Clements has had broad experience in the erection and operation of dredging plants in the tropics, and all plans were thoroughly mapped out by him before the work was started. Native labor is none too efficient and the rate of pay averages $1.50 per day. What the workers lacked in quality we were obliged to make up for in the number employed.

Dredging started Nov. 1, 1924, and about one month was required in working out of the launching pond and opening up the dredging face, so that real operations began only on Dec. 1. In working out of the pond considerable clay was encountered and at first this gave much trouble.

The dredge has operated steadily since it started over a year ago. Moreover, the enterprise was on a profitable basis soon after starting and has remained so ever since. The life of the property is estimated at about eight years.

Operating Profit 11.98c. per Yard

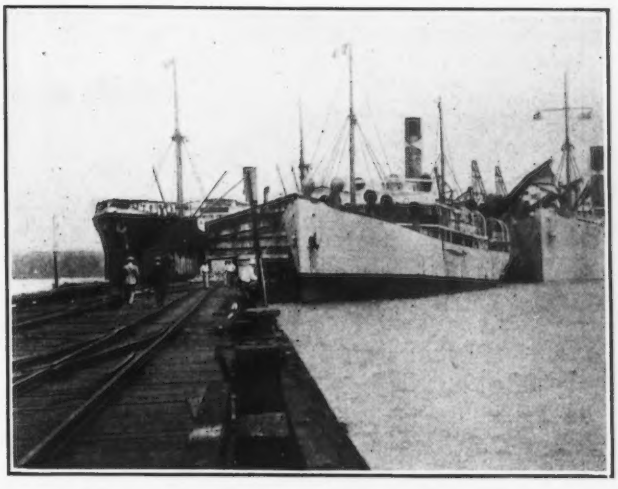
Dredge operation produced up to Jan. 1, 1926, $278,610; the number of yards dug was 1,312,000; gross yield per cubic yard, 21.24c.; operating expense per cubic yard, 9.26c., and the net return per cubic yard, 11.98c.

Operating costs were divided as follows:

Labor	$61,517
Dredge supplies	13,931
Camp maintenance	12,319
Power plant maintenance	16,979
General expense	13,058
Bullion expense	3,736
	$121,540

Expenses of operation are somewhat higher than might be expected in a semi-tropical country, but unusual provision is essential for the maintenance of the white men and their families in the way of special medical care and social work, as every inducement must be offered to get good men to live under these difficult conditions and to keep the men and their families healthy and contented.

The yardage has been somewhat lower than usual for this size of dredge, but it is due to the presence of many large boulders, some of which are too large to be passed through the screen. Therefore, special efforts are required to remove them from the bucket line, which consequently causes loss of digging time and yardage.



Dock at Puerto Barrios where dredge machinery was unloaded

Seeking New Fields

Climatic conditions are fairly favorable; the days are warm and the nights always cool and comfortable for sleeping. The United Fruit Co., which has developed this country extensively, maintains a large and well-equipped hospital at Quirigua, about twenty miles from our mine. This hospital serves us well, in case of need. I recently returned from a visit of inspection of this mine and while there I visited the hospital at Quirigua, as well as the noted ancient Maya ruins. The hospital proved to be splendidly located and excellently managed; in fact, it would compare most favorably with modern hospitals in the United States and Canada.

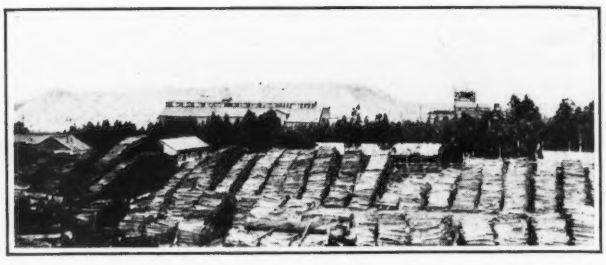
The Guatemalan Government has shown a keen interest in the operations of this company and has sent a number of officials to visit the mine from time to time for the purpose of observing our operations. One can rest assured of good protection and assistance from the government. It is the hope of this company that more dredging ground will be discovered in this same section of country, so that it may extend its operations. Several prospecting expeditions have been exploring the adjacent country during the last year, and though some further discoveries of good-looking placer ground have been made, it still remains to be proved whether or not a sufficiently large dredging area exists to warrant the installation of expensive equipment.

Determining Silver in Zinc-Retort Residues

Zinc-retort residues usually have such a high carbon content that an oxidizing charge is necessary to get a satisfactory lead button for the determination of silver, according to V. Hassreidter in *Metall u. Erz.* (abstracted in *Chemistry & Industry*). The following charge is recommended: 15 g. of residues, 75 g. of lead dioxide, 10 g. of sand, and 45 g. of sodium carbonate. If the button weighs more than 60 g. the requisite amount of nitre should be added in order to obtain a 60-g. button, which is then scorified and cupelled as usual.

View of the Co-operative Exchange Yard, near Johannesburg

Tailing heap at left in background. Trees shown were planted for windbreak



Co-operative Exchange Yard seen from a different viewpoint

This yard covers thirty acres. Most of the timber is from planted forests. Trees in the background were planted.

Mine Timber on the Rand*

Originally a Treeless Country, by Forestation This Region Now Produces 40 per Cent of Its Requirements

By Harry E. Tufft[1]
Washington, D. C.

IN RECENT YEARS the decreasing supply and rising cost of good mine timber has led a number of coal-mine operators in Pennsylvania and a few of the metal-mine operators in the Lake Superior district to take up reforestation as a means of insuring a future supply of mine timber. Timber planting for mine use has also been started in the coal-mining regions of the Middle West.

In view of the fact that the planting of trees for mine timber will probably increase in the future, it is of interest to note what has been accomplished in the past quarter century in the great gold-mining district of the Transvaal, in meeting its mine-timber problem.

The mines on the Witwatersrand, discovered in 1886, are situated in a treeless country. Mine operators have for years imported all of the heavy timber required in plant and shaft construction. This imported timber is chiefly pitch pine, Oregon pine, and Douglas fir from the United States. The price varies from 4s. to 6s. per cu.ft., or roughly $1 to $1.50. Baltic timber from northern Europe is also used in large quantities for all kinds of construction work. Timber in the past has also been imported from Australia, the most favored variety from that country being the kauri gum, a strong, tough variety of eucalypt. This timber was used to some extent as shaft timbers, stamp guides, and mud sills.

In the early days of mining on the Witwatersrand, a large quantity of indigenous timber was utilized, chiefly for props, stulls, and in constructing packs, by the method described later. The gradual depletion of timber within easy reach of transport, and the increasing requirements of the mines as the workings increased in depth, led to the substitution of other timber.

Increasing demand for mine props has stimulated the planting of exotic trees in various parts of the Union of South Africa where conditions are favorable to growth. The earliest plantations consisted almost entirely of various species of eucalypt, these being favored on account of their rapid growth; but plantations of fir, pine, and other trees for general commercial purposes were also established. In the course of time it was ascertained that some varieties could not be successfully established under the climatic and soil conditions of the localities in which they had been planted. Other varieties seemed to flourish exceedingly well.

The earliest plantations were chiefly *Eucalyptus globulus*, or blue gum. This tree appears to have been introduced from Australia more than half a century ago, and was planted chiefly around homesteads. Under proper conditions of cultivation, rainfall, and treatment it makes very rapid growth. Timber from this tree is reported to be fairly satisfactory for supporting heavy ground, bulging perceptibly in time to give warning of moving ground. The blue gum was early introduced into California, but the California-grown wood has not proved to be a strong, reliable timber for use as mine supports. It would appear from this that conditions in South Africa are more favorable than those in California for producing a stronger timber, or that the South African planters have better methods of culture.

In plantations about 300 miles from the Witwatersrand, the best results are said to be obtained by thorough cultivation and wide espacement. Eucalypts planted 12 ft. by 12 ft. make exceedingly vigorous growth and form a complete canopy in two years. In some plantations the ground is cultivated four or five times before planting the young trees, thus producing finely cultivated soil, the benefit of which is reflected in the vigorous growth of the trees.

In the last twenty years many other varieties of eucalypt have been introduced into the Transvaal. The variety principally favored in the Witwatersrand area, a country which is subject to heavy frosts in winter, is *Eucalyptus viminalis*. However, this tree, though growing freely, is not regarded as entirely satisfactory for mine timber. During the last year it has suffered from the attacks of the snout beetle (*Gonipetrus scuttellatus*), an insect which, both in the mature and larval form,

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[1]Assistant mining engineer, Bureau of Mines.

defoliates the trees, destroying the leaders or tips of the branches. This insect is presumed to have come into South Africa from Tasmania. Other varieties which appear to be less susceptible to the attacks of the snout beetle are *Eucalyptus rostrata* and *Eucalyptus maidenii*. Many other varieties have also been planted. Of late years *Eucalyptus saligna* has been used for mining purposes. In the Northern Transvaal under forest conditions—that is to say, on mountain slopes, carrying deep soil, with an average rainfall of about 50 in.—this tree grows as rapidly as one foot per month. Under different climatic conditions the growth is slower. In Natal, this tree is also being grown successfully and promises to become a valuable commercial timber which can be utilized for making boxes and many other purposes. Saligna is now being used in considerable quantities on the Witwatersrand, chiefly for lagging, stulls, and posts. To these purposes it is well adapted, owing to its straightness.

Though eucalypt timber is being used today for the severest mining services, there are prejudices against it. It is very heavy, sinks in water, and is difficult to work. Seasoning also is very slow and difficult, even under the best conditions, and the timber tends to warp, twist, and crack. Eucalypt planks have, however, been found satisfactory for uses where no great amount of framing is required, and its toughness makes it desirable for such rough purposes as the lining of ore bins.

Of the pine group, the two trees *Pinus pinaster* and *Pinus pilaster*, which are not indigenous to South Africa, appear to have been introduced more than a century ago, when considerable quantities were planted around Cape Town by the early settlers. The African grown pine has not been a satisfactory substitute in mining use for imported pitch pine or Oregon pine, but some users consider it suitable for certain purposes, as in engine brake blocks. During the war period, however, considerable quantities of this timber were transported to the Rand, a distance of nearly 1,000 miles, and used in substitution for pitch and Oregon pine, which at that time had soared to a price of approximately 10s. per cubic foot. Although the native-grown pine timbers are not being used to any great extent on the Witwatersrand mines, the eucalypt is being used in considerable quantities for timbering other than in construction and shaft work—that is to say, for supporting workings and similar rough purposes.

Bulk of Mine Timber Comes From Wattle Plantations

The bulk of the Witwatersrand timber supplies are drawn from the wattle plantations in Natal. Wattle (*Acacia decurrens*, var. *mollissima*), introduced into Natal over half a century ago, is planted primarily for the tannin contents of its bark, the timber resulting from the stripping of the plantations being a byproduct. At one time this timber did not find much favor with the mines, but today it is the standard timber used. Though wattle flourishes chiefly in Natal in selected areas, where mist is frequent, it also grows well in other parts of the Union—namely, in the Eastern Transvaal. Except for pitch pine, Oregon pine, and Baltic timbers, practically no timber is imported by the mines from outside South Africa.

As the mines of the Witwatersrand become deeper, and the ramifications of the mine workings more extensive, larger quantities of timber are required for supporting the workings. In 1921, according to the annual report of the government mining engineer, timber purchased by the mines amounted in value to £999,415 (roughly $4,860,000) and in 1922, when owing to a strike the mining industry was shut down over three months, it amounted to £766,763 (say $3,631,000). These figures include the imported pitch, Oregon, and Baltic supplies.

It has been estimated that more than 10,000 bogies (250,000 short tons by weight) of mining props are delivered to the Witwatersrand annually from the wattle plantations of Natal. The cost of rail haulage is an important item, sometimes amounting to more than 60 per cent of the total delivered cost of the timber. The two principal items of timbering expense are for mining poles (stulls) and lagging, the respective figures being £559,549 for 1921, and £448,969 for 1922, these amounts being included in the items (£999,415 and £766,763) above given.

Timber costs vary widely, but the two predominant sizes of lagging used on the Rand—namely, native round poles 8 ft. long and 4 in. in diameter at the small end, and poles 8 ft. long and 5 in., respectively—now cost roughly 1s. and 1s. 6d. each at the mine. No general figure for shaft timber is available, but at one mine imported timber cut ready for shaft sets cost in 1923 around 6s. per cubic foot of timber, delivered at the shaft.

The increase in the quantity of timber used is due partly to the fact that the method of supporting backs in the stopes has altered materially in the last few years. Formerly, in the stopes rock pillars were left to support the back or "hanging," but the expense of ultimately recovering the ore from the pillars led to the more general use in stopes of cribs or "pigsties." These cribs are constructed of light lagging and are filled with waste rock, which is carefully packed between the poles.

In the Consolidated Main Reef Mines & Estates, Ltd., according to Hingle[2], the drives or roadways are kept open by a double row of 8-ft. "pigsties" on the upper side, and, where possible, rock packs 30 ft. wide are built on the lower side of the drive with sties at the corner. In addition to the lagging used for building cribs, large quantities of heavier timbers are employed as props. Owing to decay, both cribs and props have to be replaced from time to time, the former once and the latter perhaps twice in the life of the area. Labor cost for replacement is about three times that of the timber used. The cost of drive timbering is estimated at £1,160 per month, the mine producing 50,000 tons of ore monthly; thus the cost approximates 95c. per ton of ore.

Timber Purchased Through Co-operative Exchange

The largest group of companies on the Witwatersrand (the Central Mining-Rand Mines group) purchases its timber through the Co-operative Exchange Yard, Ltd., an organization to which all mines of that group are affiliated. This organization buys and distributes about 40 per cent of the total consumption of timber of the Witwatersrand mines. Views of the yard are shown in the accompanying illustrations.

According to data that I obtained from the Co-operative Exchange Yard, the lagging poles principally

[2]Hingle, L. D.: "The Preservative Treatment of Mine Timber," *Jour.*, South Afr. Eng., Vol. 20, March, 1922, pp. 152-158.

used in the cribs or "pigsties" on the Witwatersrand are 4 to 5 in. in diameter at the small end and 8 ft. long. These are packed one on top of the other in the form of a square, and then filled with waste. Up to quite recently it was common practice to notch or joggle these poles at fixed centers, thus insuring stability and facilitating construction. This, however, led to a loss of rise in the timber of approximately 10 per cent, and laterally a method of boring the poles at set distances and fixing them in position by means of iron pegs ½ to ⅝ in. in diameter and 3 in. long has come into use on many of the mines, and has led to the abandonment of notching. This method of boring and pegging was devised by H. W. Adler, sectional manager of the Crown Mines, Ltd. It has led to the increased use for cribs of smaller timber down to 3½ in. in diameter at the small end. Considerable quantities of poles of larger diameter are also used, but the tendency today is to utilize smaller timber in greater quantities.

Experiments with Concrete Packs

A few mines are experimenting with various types of concrete packs. For some concrete packs special shaped reinforced concrete members are used, the heads having a ball-and-socket lock. Each pack has wooden cushions on top. The cost of concrete is more than timber (about 6s. per member), but the pack is more permanent. It does not stand oblique pressures satisfactorily, and seems more suited to the flatter working of the Far East Rand, where it is used on a few mines to an increasing extent. Experiments are being made in some mines in building concrete pillars *in situ*, and in round slotted slabs threaded on a central pillar, and the slots staggered by rotating the slabs to varying degrees.

Experiments on wire packs are under way at the Village Deep. The pack is built of four posts and wire netting, in sections about 3 ft. high. The bottom section is filled with waste before stringing a second section. At top, if necessary, sections are overlapped for correct height. For the wire pack, the circular form is the strongest.

Amount of Timber Used

The group of mines served by the Co-operative Exchange Yard, Ltd., which includes seventeen of the larger mining companies, used about 25,000,000 linear feet of timber in 1923, of which 24,000,000 ft. was from 3 to 6 in. in diameter at the small end, in lengths of 6, 8, and 12 ft.

A comparison on the basis of tons of ore milled and the amounts of timber used is shown below:

	Ore Milled, Tons	Linear Feet
1921 (six months July to December)..	5,955,370	5,197,870
1922 (six months July to December)..	9,592,620	8,416,720
1923 (six months July to December)..	12,476,330	10,910,930

If 25,000,000 linear feet be considered as 40 per cent of the requirements for the mines on the Witwatersrand in 1923, the total timber used would be about 62,500,000 linear feet. The amount of gold ore milled on the Rand in 1923 was 26,538,875 tons. Dividing the number of linear feet by this latter figure shows a timber consumption of 2.4 linear feet per ton. This timber would probably not average less than one board foot to the linear foot, and might be as much as two board feet, which indicates that the consumption of timber is between two and one-half and five board feet per ton of ore milled in the Witwatersrand area.

Experiments have been in progress for some time on the Witwatersrand mines in the treatment of wood with preservatives. Promising results have been obtained by the use of zinc sulphate, a byproduct of the metallurgical works, and the tendency to preserve timber is increasing. A good deal of work has been done at the Experimental Timber Preservative Station at the Transvaal Forest Department, Pretoria. The plant at this station is equipped with apparatus both for open tank and pressure treatment.

Conclusion

In the utilization of timber on the Witwatersrand, the most striking features are as follows:

1. The amount of timber required per ton of ore mined in these mines is low compared with the amounts required in most deep mines in the United States. The data available indicate that two and one-half to five board feet per ton is used in the Transvaal.

In the United States, according to data obtained by the Bureau of Mines, a few gold and copper mines working large bodies by shrinkage stoping, caving, or other methods, that practically dispense with timber in the stopes, use timber ranging from less than one board foot per ton mined to more than six board feet; but in deep metal mines with timbered stopes the consumption is much higher. Butte copper mines use about twenty board feet per ton and the silver-lead mines in the Cœur d'Alene about fourteen board feet per ton. On the whole, from figures supplied from various mines in the United States, ten to fifteen board feet per ton is a common figure.

2. Although the quantity of timber per ton of ore used on the Witwatersrand is not large, the total required annually on account of the large scale of mining in the Witwatersrand area is impressive, having a value of about $4,000,000 in United States currency, and forms one of the principal items of freight haulage.

3. The mining region of South Africa is still largely dependent for construction purposes on timber imported from overseas, chiefly on pitch pine and Oregon pine imported from the United States, but for most mining purposes other than construction and shaft work the timber won from the wattle plantations in Natal and eucalypt plantations in various parts of the Union of South Africa, supplemented by indigenous timber from numerous districts within range of rail haulage, has supplied the mines with their requirements.

4. Mine timber thus secured serves all the practical purposes in or about the mines. The work of the Forest Department of the Union of South Africa has encouraged numerous land owners to plant timber in suitable districts.

5. The life of timber in the mines is very short unless the timber is treated. For this reason many of the mines are now experimenting with preservatives. Much timber is, however, destroyed by pressure caused by settlement of the workings.

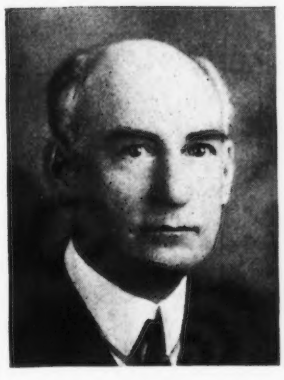
Acknowledgment

This paper is based chiefly on information which was obtained directly through correspondence, supplemented by various references scattered through the literature on mining in the Transvaal. Special acknowledgment is due to H. A. Read, manager of the Co-operative Exchange Yard, who kindly supplied much original data and made helpful criticisms.

Petroleum and Natural Gas in Montana

A Summary of the Present Situation—Drilling Results and Production to Date in the Various Fields That Are Being Explored and Developed

By J. P. Rowe
Assistant Professor of Geology, State University, Missoula, Mont.



J. P. Rowe

OWING to the fact that Montana's resources of petroleum and natural gas have undergone such development since I wrote my earlier article[1] on this subject in 1920, and because many requests for information have been received, I have undertaken to discuss, briefly but without omitting too much, the petroleum and natural gas situation in Montana as it is today. The article mentioned above deals largely with conditions governing the accumulation of natural oil and gas and the geology of the deposits developed in Montana up to that date.

At present there are seven rather distinct fields in Montana producing petroleum, and seven distinct fields producing enough natural gas to be of commercial value. The oil fields are as follows, given in the order of their discovery: (1) Elk Basin, Carbon County (1915); (2) Devil's Basin, Musselshell County (1919); (3) Cat Creek, Petroleum County (1920); (4) Soap Creek, Big Horn County (1921); (5) Kevin-Sunburst, Toole County (1922); (6) Genou, Chouteau County (1923); and (7) Lake Basin, Stillwater and Yellowstone counties (1924).

The gas fields, in the order of their discovery, are: (1) Glendive, Dawson County, included in the Cedar Creek anticline (1913); (2) Havre, Hill County (1915); (3) Baker, Fallon County, included in the Cedar Creek anticline; (4) Cabin Creek, Fallon County (included in the Cedar Creek anticline); (5) Elk Basin, Carbon County (1915); (6) Sweetgrass Hills, Toole County (1915); (7) Kevin-Sunburst, Toole County (1922); and (8) Bowes structure, Blaine County.

Each field will be discussed briefly so as to cover the geology, area, and general development, as well as such other topics that are likely to be of interest and value to the reader.

Two Producers in Montana Part of Elk Basin Field

Elk Basin.—The Elk Basin field or structure is an elongated dome about one mile by a half mile in dimensions, with strata dipping rather steeply away from the basin on all sides (quaquaversal). In fact, the top of the dome has been etched into a basin by erosion. The field lies partly in Wyoming and partly in Montana. According to Trumbull, former State Geologist of Wyoming, it was drilled during the fall of 1915, and oil was found in two of the Frontier sands. The age of the Frontier formation is middle Colorado of the upper Cretaceous. The pool is about 400 acres only in size. A 6-in. pipe line, 30 miles long, connects the field with Frannie, a town on the C. B. & Q. railroad. The altitude of the field is about 3,400 ft. The depth to the oil sands is about 900 ft.

Only two of the wells producing in this field are in Montana; they are Elk No. 9 and Mack No. 11. The others are in Wyoming. The oil is rather high in gasoline and kerosene, and when the wells were first brought in much gas escaped with the oil. Casing-head gas now, however, is turned into casing-head gasoline. When the wells were first brought in, they were flowing, but soon had to be pumped. This field is still a fairly good producer, as the accompanying production figures, furnished by C. W. Gross, of the Montana State Board of Equalization, will show. The Wyoming production from this field in 1923 was 646,780 bbl.

Table I.—Petroleum Production of the Elk Basin Field, 1921-24

	Barrels		Barrels
1921	24,350	1923	9,696
1922	13,571	1924	(a) 6,452

(a) Valued at $10,448.

Devil's Basin—Though this locality has never produced petroleum in commercial quantities, enough has been found to show that it has commercial possibilities. According to Lambert, the well drilled by the Tri-City and Van Duzen Oil companies in Section 29, T. 8 N., R. 21 E., on the Woman's Pocket anticline, went through the red beds of the Kootenai formation and found a little heavy black oil in the underlying Quadrant (Pennsylvanian) sands. In November, 1919, the Van Duzen "discovery well" in Devil's Basin, Section 24, T. 11 N., R. 24 E., found showings of oil in these sands. Drilling now being done or that has recently been done in this field is as follows:

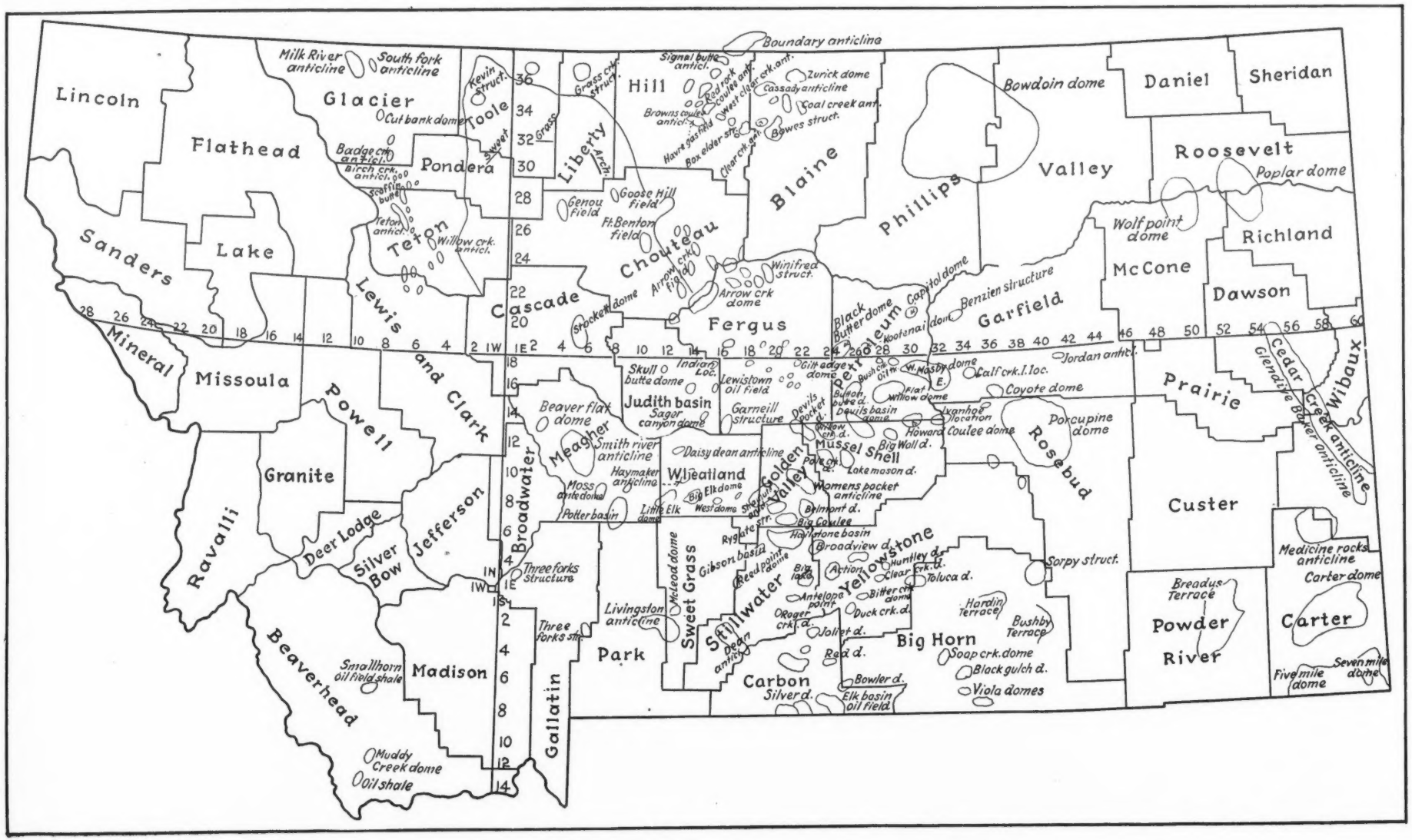
Lincoln Oil Co. deep test—NW. ¼ of SW. ¼ 25-11-24 E. Now drilling at 800 ft.
A.B.C. No. 3—NE. ¼ 26-11-24. Now shut down. Depth, 1,000 ft.
"56" Petroleum No. 1—SE. ¼ NW. ¼ 9-11-24. Shut down. Depth, 2,500 ft.
Adams Land Co. NW. ¼ SE. ¼ 24-11-24 S.D. oil. Depth, 1,200 ft.
Absaroka Oil Development Co. SE. ¼ NW. ¼ 9-11-24. Depth, 2,080 ft.
Alberta Block Coal Co. No. 2. SE. ¼ NE. ¼ 26-11-24. Shut down. Depth, 1,460 ft.

Cat Creek Field Second Commercial Producer in State

Cat Creek.—The Cat Creek field was the third in Montana to show oil and the second commercial producer. The crude oil from it is high in the light oils, such as gasoline, napthalene, and kerosene, and was discovered in 1920. The discovery well was sunk in the Mosby dome. This structure is part of the Cat Creek anticline, which is made up of a number of domes. The anticline proper runs in a northwest-southeast direction from the middle of T. 14 N., R. 31 E., to and beyond Black Butte, T. 17 N., R. 23 E. The longest bulge in the anticline is at its eastern end and is composed of three domes—the East Mosby, Mosby, and West Mosby.

[1] *Engineering and Mining Journal*, Aug. 28, 1920.

Map of the State of Montana



Probable oil and gas structures discussed in the text of the article

The other domes lying to the west on this anticline are the Oiltana, Brush Creek, Kootenai, and the Black Butte. According to F. G. Clapp, the Colorado shales are exposed in all of these structures with the exception of the Kootenai dome, which shows Kootenai outcrops.

I have visited all of the secondary structures or domes on the Cat Creek anticline. The top of each has been etched by erosion, this leaving a depression and making rather prominent escarpments of sandstone on each side. In this field, the northeast escarpment has in nearly all localities a steep dip, running as high as 35 deg. or more. The southwestern limb of the anticline has a more gentle dip, although it is usually found to be several degrees.

The oil is found in the Kootenai sands. Up to Aug. 25, 1925, there were 121 producing wells in the first sand and forty-three producing wells in the second sand. At present there are ten wells either being drilled or being prepared for drilling. Those being drilled are for the most part in T. 15 N., R. 29 E., although there is one in T. 14 N., R. 28 E.; one in 15-28; and one in 15-30. At present, one well is at a depth of 2,400 and still being drilled. The first sand is between 1,200 and 1,300 ft. from the surface. Pipe lines from the field to Winnett, about 20 miles, convey the oil to the Chicago, Milwaukee & St. Paul R.R., where it is shipped to local and other refineries. Gasoline made by local refineries from the Cat Creek crude must be blended with casing-head gasoline to bring it up to standard. The output from this field in 1924 was 1,529,202 bbl., according to official reports, which was valued at $2,439,277.

Oil on the Crow Reservation

Soap Creek.—In 1921, the Soap Creek anticline, in Big Horn County, south of Hardin, became a producer. This structure is on the Crow Indian Reservation. Oil was struck in the Quadrant sands about 1,650 ft. below the surface. It is a heavy, black variety, similar to the oil from the Lander (Wyo.) field, which probably comes from the Pennsylvanian formation. The structure is not large, and owing to this fact and the lack of transportation facility not much crude has been produced. State reports show that 1,960 bbl. was produced in 1923, valued at $980. No production is given for 1924. The latest report gives five Western States company wells producing, but no drilling.

Kevin-Sunburst.—The first well in the Kevin-Sunburst field was brought in in March, 1922. It is known as the Gordon Campbell "discovery well," and is in Section 16, T. 35 N., R. 3 W. It had a flow of gas, from 500,000 to 1,000,000 cu.ft. per day, from a sand near the base of the Colorado. It also found a showing of oil in the Sunburst sand at the base of the Kootenai formation and about 200 ft. above the Madison limestone, and yielded a few barrels of oil a day from the basal sand of the Ellis formation, just above the massive Madison limestone, which was reached at a depth of 1,770 ft. The well stood idle from March until June, 1922, when about 100 bbl. of oil was pumped from it in one day. Its initial yield was estimated at 5 to 10 bbl. a day.

The Sunburst well, in Section 34, T. 36 N., R. 2 W., was completed early in June, 1922. It encountered gas in the sand near the base of the Colorado shale and oil in the Sunburst sand, which here is 200 to 250 ft. above the basal sand of the Ellis formation, and was struck at a depth of 1,550 ft. The first day of steady pumping yielded about 200 bbl. After a month of steady pumping the well was estimated as good for 50 bbl. a day. It was still being pumped in the summer of 1925.

More Than 700 Wells Reported Drilled

Since 1922, more than 700 wells drilled on the Kevin-Sunburst dome have been listed in the bulletin of the Northern Oil Information Bureau, which is published weekly at Shelby, Mont. Most of the wells on the north side of the dome, if drilled to the basal sand of the Ellis, show at least traces of oil or gas in one or more of the sands, and most of them have been oil producers, whereas those on the south side have yielded gas usually from the Sunburst or higher sands and very small traces of oil, if any. The south side of the dome has not been tested sufficiently to determine whether there is any other reason for this condition than the varying porosity of the basal sand of the Ellis.

In 1923, the largest producers were in the northern part of T. 34 N., R. 2 W., near the north line of Section 9. In 1924 a large part of the production came from the vicinity of Section 4, T. 34 N., R. 2 W., and in 1925 the drilling of some large wells in Sections 29, 30, 31, and 32, T. 35 N., R. 1 W., helped to raise the total production of the field. The field is being drilled most actively in the neighborhood of the more successful wells, and the areas are being expanded, but other large centers of production may be struck at any time, and the peak of production will probably not be reached for several years.

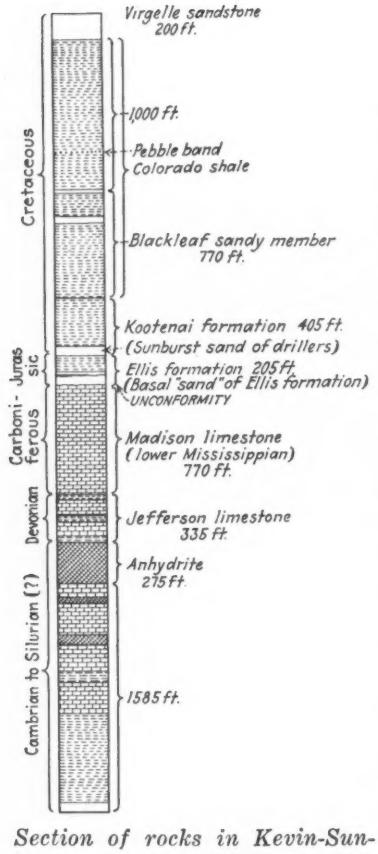
To date, oil and not gas has been the objective of exploration in the Kevin-Sunburst field, but, even so, an important gas field has been found to exist on the south side of the dome, and considerable quantities of gas are also being produced along with the oil from areas further north. Gas produced south of the oil field is now being used as domestic fuel in the town of Shelby, and in the field itself gas is being used as fuel for drilling. The demand for gas will undoubtedly continue to increase, with profit to producers, provided wells are carefully drilled and cased and the gas is used only for essential purposes.

Production Chiefly From Lower Ellis

The oil from the Sunburst sand has a dark color, an odor like that of gasoline, and a gravity of about 35 deg. Bé. That from the basal sand of the Ellis formation is nearly black and has an odor of sulphur and an average gravity of about 30 deg. Bé., known analyses varying from 27½ deg. to 34 deg. Bé. As most of the oil produced comes from the latter sand, the grading of price according to gravity test has not as yet been applied. The present posted price of Kevin-Sunburst crude is $1.35 a barrel.

Some of the data presented in the preceding paragraphs have been taken from a recent report by Collier and Boyer. The latest map of the district is also shown in one of the accompanying cuts.

The Kevin-Sunburst district lies in Toole County about 20 miles north of Shelby and 10 miles south of the Canadian boundary at Sweetgrass. It is a part of the Sweetgrass arch. According to Stebinger, in Bulle-



Section of rocks in Kevin-Sunburst oil field, Toole County, Mont. After U. S. Geological Survey

tin 641 of the U. S. Geological Survey, this structure is characterized by a very broad anticline or arch that extends in a general northerly direction. This broad uplift brings the Colorado shale to the surface in the area about 75 miles wide, surrounded on all sides but the south by outcrops of the Virgelle sandstone (Eagle). The arch extends southward from the Sweetgrass Hills to the region beyond Teton River, when it flattens out because of the presence of gently northward dips induced by the uplift of the Belt Mountains, still farther south. On the north this broad uplift extends to and beyond Belly River, in Alberta, but it pitches slightly, allowing the overlying rocks of the Montana group to arch over its crest. On the geologic maps of southern Alberta it appears as a broad belt of "Belly River beds," flanked on each side by the overlying marine shale. The Bow Island gas field of southern Alberta lies in the center of this broad arch.

Kevin-Sunburst Field Studied by Survey

In 1922, the U. S. Geological Survey sent out two of its geologists, A. J. Collier and W. W. Boyer, who made a careful survey of the Kevin-Sunburst field, and the Survey issued a press notice bulletin on Sept. 7 of that year. The geological section and subsurface or structure map shown here is a result of the work of the geologists named. As will be seen from the section, the Campbell well is lower Ellis (Jurassic) and the Sunburst well is lower Kootenai. It will also be noted that the structure of the Kevin-Sunburst field is a low dip. The highest point on the structure is only 500 ft. above the Campbell well, although it is 10 miles away.

The report to which reference was above made states:

"It is not to be expected that this broad dome will be productive throughout. A number of distinct pools may be found on it, their locations having been fixed by particularly favorable conditions of porosity and possibly by minor crumpling in the oil-containing formations. The formations include the Colorado, Kootenai, Ellis, Madison, and perhaps the underlying Devonian."

The writers conclude:

"The discovery of oil in the comparatively flat-lying strata of the Sweetgrass arch shows that sharp anticlined folds are not absolutely essential for the accumulation of oil in the Rocky Mountains. There can remain no doubt that gentle folds, such as those that yield oil in the Mid-Continent region, should be examined, particularly for oil in strata older than Cretaceous."

They suggest that if the Kevin-Sunburst area proves to be an extensive and valuable oil field, regions of similar structure (low dip) in Montana, such as the Bowdoin dome, in Valley and Phillips counties, and the Porcupine dome, in Rosebud County, should be thoroughly prospected.

Since the above was written many successful wells have been drilled in the Kevin-Sunburst field. On Nov. 7, 1925, there were 407 producing oil wells and 28 producing gas wells in this district. For the most part, the producers are in T. 35 and 36 N. and R. 1 and 2 W.

Since Collier and Boyer recommended the thorough prospecting of low-dipping structures in Montana, such as the Bowdoin dome and the Porcupine dome, considerable drilling has been done on both of these structures. The Homestake Oil Co., one of the best independent producers in Montana, drilled two wells, one of which reached a depth of 2,375 ft. Results were negative. The Bowdoin Oil & Gas Co. drilled to a depth of 3,150 ft., with apparently the same results. Several wells have been drilled to various depths on the Porcupine dome. The deepest reached a depth of 2,300 ft. So far as can be learned, none of the wells drilled on this structure has been successful.

The latest news from the Kevin-Sunburst field was to the effect that the Fulton Oil Co. had just completed the biggest well ever struck in that locality. The well is on the famous William Byrne lease, No. 8 location, and its exact locality is in the NW. ¼ of Section 31, T. 35 N., R. 1 W. Though no accurate test of the amount of oil the well would produce was made, it filled a 250-bbl. tank in twenty-five minutes, at which rate it would yield 12,000 bbl. per day.

Oil Once Reported in Genou Field

Genou Field.—In the spring of 1923, a report went out that a good well had been brought in near Genou. Nothing since has been reported. The Northfield Reliance No. 1 reached a depth of 2,800 ft., but is now abandoned. This is within the Sweetgrass arch, but several miles east of the producing area of the Kevin-Sunburst field. It is put down here as only a reported producing area, although since the first report nothing definite has come from this locality.

Little Results From Early Drilling in Lake Basin

Lake Basin Field.—U. S. Geological Survey Bulletin 691, page 144, mentions a well drilled in 1902 in 17-3N.-21E. in the Hailstone basin. This well, started in the Colorado, was drilled to a depth of 1,426 ft., and abandoned. Showings of oil and gas were encountered at 932 and 1,037 ft.

In 1921 three wells were drilled in this area. The Harrison Oil & Gas Co. drilled in 21-1S.-21E., Antelope Point, starting in the Judith River formation and stopping in the Colorado at an approximate depth of 3,200 ft. A showing of oil was found in the Colorado, but the well was abandoned.

The Barnsdall-Foster Co. drilled in SE.SE.NE. 34-2N.-21E., Battle Butte, starting in the Bearpaw and stopping in the Eagle at a depth of 1,150 ft. One-half million feet of gas was encountered in the Eagle formation, which caught fire, destroying the rig. The hole was abandoned.

The Molt well, in SW.SW.NW. 5-3-21E., started in

the Colorado and stopped in the Ellis at a depth of 3,000 ft. No showings of oil were obtained. Warm fresh water was encountered at 3,000 ft. and the well was abandoned.

In 1922 the Barnsdall-Foster Co. drilled its second well on Battle Butte structure in SW.SW.NW. 35-2N.-21E., starting in the Bearpaw and stopping in the Kootenai at a depth of 4,050 ft. A show of oil was found in the Eagle formation at 1,150 ft. and gas was encountered in the Colorado, but the casing was pulled and the well abandoned. This same company then drilled in the NE. ¼ of 35-1N.-21E. The well was started in the Bearpaw and was stopped in the Eagle when 2,000,000 feet of gas was encountered; after which the well was capped.

Harrison *et al* drilled near Columbus in 30-2S.-21E., Big Lake; the well was started in the Judith River formation and was abandoned after reaching the Colorado at 1,125 ft. The Church well, in NE.NE.NW. 26-2-21E., Big Lake, was also started in the Judith River formation and was abandoned in the Eagle at 1,200 ft. A showing of oil was encountered. The "discovery well" in this area is the Hepp No. 1 in NE. ¼ of Section 26-IN.-21E., which was brought in on May 12, 1924, by the Midwest Refining Co.

Big Lake Future Bright

Big Lake Anticline.—The Bearpaw shale is the predominate surface formation in the region of the Big Lake anticline. The wells producing petroleum and natural gas so far are located largely in Section 26, T. 1 N., and R. 21 E. Natural gas in commercial quantity was struck in a well in Section 35, T. 1 N., R. 3 21 E. The producing oil wells are all fairly deep, ranging from 2,920 ft. to 3,896 ft. Up to Jan. 2, 1926, three producing wells were reported. The production is shown in the accompanying table. It is claimed that the discovery of this field was made possible by the work of C. Max Bauer, chief geologist of the Midwest Refining Co. Big Lake is said to have an established inclosure of 1,000 ft. Three and possibly four probable producing horizons are within reach of the drill. The present production is said to be coming from the Dakota sand (probably Kootenai). The future of the field looks bright.

Montana's Record Daily Output 18,750 Bbl.

Commercial production by fields and months for the year Nov. 1, 1924, to Nov. 1, 1925, is given below:

Table II—Oil Production of Montana, Nov. 1, 1924, to Nov. 1, 1925 (Barrels)

	Cat Creek	Kevin-Sunburst	Lake Basin	Total
1924				
November	127,943	100,309	.....	228,252
December	117,585	95,130	.....	212,715
1925				
January	132,371	110,535	.....	242,852
February	123,491	108,666	.....	232,157
March	135,837	107,430	.....	243,267
April	122,018	118,372	.....	240,390
May	99,736	157,749	.....	257,485
June	118,244	194,215	.....	312,459
July	105,484	225,024	8,221	339,329
August	96,790	258,112	12,126	367,028
September	104,101	262,070	2,208	368,379
October	98,560	349,442	737	448,739
Totals	1,382,106	2,087,054	23,892	3,493,052

The greatest production of petroleum in Montana in a single day was 18,750 bbl., produced during the week of Nov. 28, 1925.

Table III shows Montana's oil production from 1921 to 1924 inclusive. The production for the years 1921 and 1922 were largely from Cat Creek, although Elk Basin gave its quota:

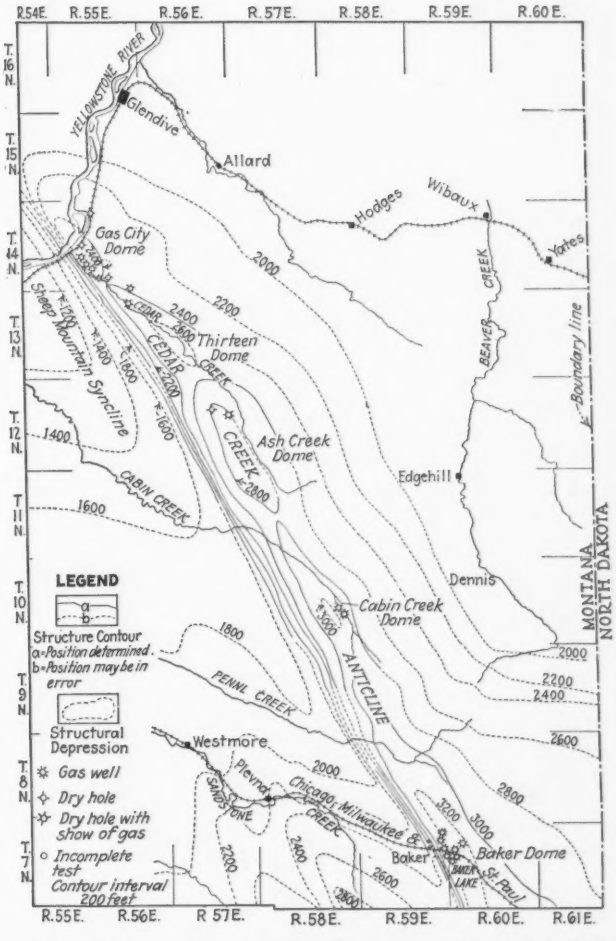
Table III—Montana's Oil Production, 1921-1924

Field	Bbl.	Value
1921		
Elk Basin and Cat Creek	1,509,000	.....
1922		
Elk Basin and Cat Creek	2,449,000	.....
1923		
Cat Creek	2,080,826	$3,360,785
Kevin-Sunburst	441,531	309,072
Devil's Basin	753	972
Elk Basin	9,696	15,801
Soap Creek	1,960	980
Total	2,534,767	$3,687,611
1924		
Cat Creek	1,529,202	$2,439,277
Kevin-Sunburst	1,187,404	1,168,329
Devil's Basin	105	157
Elk Basin	6,654	10,448
	2,723,365	$3,618,211

Montana crude is rather widely distributed for refining purposes; besides supplying the independent refineries of the state, it is sent to Whiting, Ind.; Crowley and Lovell, Wyo.; Minneapolis, Winnipeg, and several other places outside of Montana.

Natural Gas First Produced in 1913—The Cedar Creek Anticline

Glendive District.—According to the U. S. Geological Survey, the first production of gas in Montana was from Dawson County, near Glendive (T. 15 N., R. 55 E.) when in 1913 a well owned jointly by the Consolidated Oil & Gas Co. and the Mid-West Oil Co. was drilled to a depth of 2,345 ft., and at a depth of 840 ft.



Oil or gas structures in Montana, proved and probable

gas was obtained and two more light flows were found lower down. Estimated production of this locality was 1,000,000 cu.ft. per day. Production from the Glendive field doubtless comes from the Judith River formation. Several additional wells were drilled near Glendive, and the gas was piped to the city and used for domestic purpose.

Table IV—Montana's Independent Oil Refineries

Name of Refinery	Location	Year Constructed
Akscher Refinery	Near Kevin	....
Arro Oil & Refining Co.	Lewistown	1921
Hart Refineries	Hedgesville	1922
Hart Refineries	Missoula	1924
Homestake-American Refining Co.	Great Falls	1923
Kalispell Oil & Refining Co.	Kalispell	1924
Lewistown Oil & Refining Co.	Lewistown	1921
Kevtana or Montana Giant Refinery	Kevin	1923
Montana Refining Co.	Billings	1921
Northern Star Oil & Refining Co.	Sunburst	....
Reliance Refining Co.	Kalispell	1924
Roundup Refining Co.	Roundup	....
Snow Cap Oil Co.	Sunburst	1923
Sunburst Refining Co.	West Great Falls	1923
Weona Refining Co.	Winnett	1921
Yale Oil Corporation	Miles City	1922

Baker District.—Commercial natural gas was later struck at Baker, Fallon County, and also about halfway between Glendive and Baker at Cabin Creek. Little development has been done at the last-named place, although the most recent report gave thirteen producing gas wells near Baker. Gas from these wells is piped to the Baker for domestic purposes, and sells for 30c. per 1,000 cu.ft. The city uses about 100,000,000 cu.ft. per year. This gas is also used here by the Gas Products Co. for making carbon black. The Carbon Black Co. is located about one mile out of town. Its output is about two tons of carbon black daily, to make which about 2,000,000 cu.ft. of gas is needed.

Havre District.—The second place in Montana in which natural gas was found was Havre. In July, 1915, a well in SE. ¼ of Section 33, T. 33 N., R. 16 E., was brought in, the production of which was estimated to be 1,000,000 cu.ft. in twenty-hour hours. Other wells have been brought in since. The gas comes from the Eagle sandstone.

Sweetgrass Hills.—As early as 1914 wells were drilled in the Sweetgrass Hills district, and some gas was struck. It is claimed that a well drilled during 1916 struck a flow of gas estimated at 4,000,000 cu.ft. per day. This well started in the Two Medicine formation and struck the gas in the basal Colorado sandstone. It was drilled to a depth of 1,860 ft.

Conrad and Shelby.—The Conrad and Shelby district is in the Sweetgrass arch and closely associated with the Kevin-Sunburst oil district. At present there are 28 gas wells in this field. The city of Shelby uses about 100,000,000 cu.ft. of gas per year. The wells are located six miles from the city on the NW. ¼ of Section 6, T. 32, N., R. 1 W.

Bowes Structure.—The Bowes structure is found in Blaine County about 10 miles south of Chinook, the county seat. According to a recent issue of the *Montana Oil Journal*, it covers 3,000 acres of proved gas and has two completed wells, with a flow of 44,000,000 cu.ft. daily. Competent engineers estimate that the field is capable of producing 50,000,000 cu.ft. daily for fifteen years. There is a movement on foot to pipe this gas to Havre, Big Sandy, Fort Benton, and Great Falls. The building of 130 miles of 12½-in. pipe line is being planned.

Elk Basin.—Not long ago the cities of Billings, Bridger, Laurel and others near by were fortunate to have a 1-in. pipe line bring gas from Elk Basin, replacing the artificial, especially in Billings. The pipe line to Billings is 68 miles long. Artificial gas, with a heat value of about 500 B.t.u.'s per cubic foot, sells from $1.70 to $2.20 per 1,000 cu.ft. in Montana cities. In Billings, the price of natural gas is 50c. per thousand cubic feet to householders and 35c. per thousand for commercial use. The city has more than 3,400 consumers and uses about 1,000,000,000 cu.ft. of gas per year. The heat value of the natural product is nearly twice that of the artificial. When one compares the price and heat value of the two, the great value of natural gas of such quality to any community that is fortunate enough to secure it is readily apparent.

According to Albert B. Bartlett, State Geologist of Wyoming, this field produces a considerable amount of natural gas and also casing-head gasoline. The casing-head gas yields 4 gal. of gasoline per thousand cubic feet.

The U. S. Geological Survey, in "Mineral Resources of the United States" for 1921, mentions two other fields—namely, the Cone Butte dome, in Fergus County, and the Lake Basin dome, in Stillwater County. On the Lake Basin or Big Lake structure there are reported to be five wells from which more or less gas comes. The largest of these wells is in Section 35, T. 1 N., R. 21 E. A production of 2,000,000 cu.ft. per day is claimed for it.

There are other localities in Montana where varying amounts of gas have been struck while drilling for oil. Among these are: Broadview dome, in Section 13, T. 3 N., R. 22 E.; Cherry Ridge, in Section 5, T. 35 N., R. 21 E.; Mosher dome, in Section 34, T. 38 N., R. 24 E.; and the Sherard or Birch Creek structure, in Section 17, T. 25 N., R. 17 E.

The Zinc Industry of South Wales

The Welsh zinc industry in 1924 imported 58,724 long tons of raw materials and 2,025 of slab zinc and in 1925 imports were 78,005 and 3,815 tons, respectively, according to a statement from A. B. Cooke, U. S. Consul at Swansea. The raw materials, 95 per cent concentrates, come principally from Australia, imported under contract between the British Government and a British commercial concern in London. Analysis of the concentrates furnished by a local assayer shows 48 per cent zinc, 28 sulphur, 10 lead, and 12 oz. per ton of silver. Imports of slab zinc in 1925 came from Germany, Belgium, the Netherlands, and Denmark. The greater part of the slab output and of the imports is used in the Swansea district in the galvanized sheet works.

At the beginning of 1925 six concerns were engaged in the manufacture of slab zinc, but at present only the National Smelting Co., Ltd., the English Crown Spelter Co., Ltd., and the British Copper Manufacturers, Ltd., the last an amalgamation of two plants, are operating, and these at about 70 per cent of capacity. It is understood, however, that all are extending and modernizing their equipment.

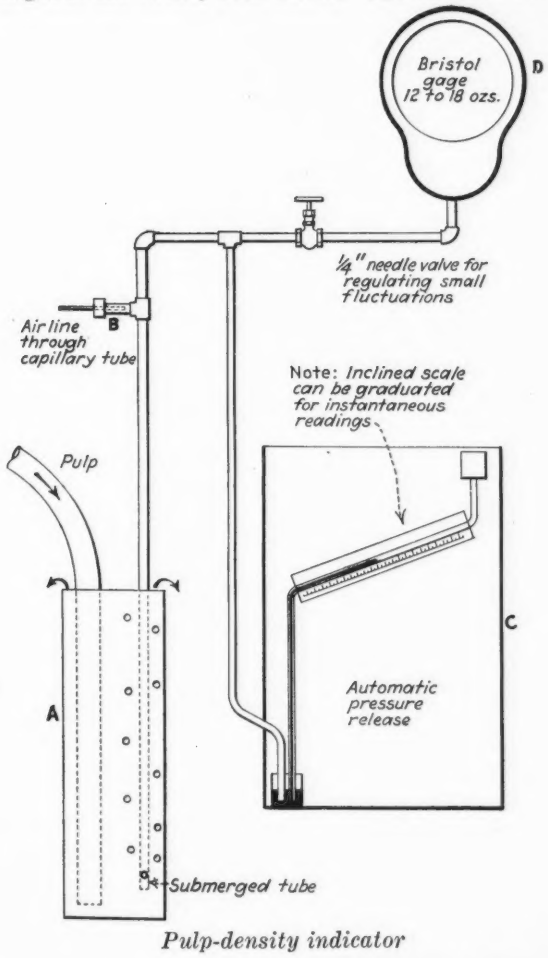
Local authorities consider the 1926 outlook good for the local industry. Galvanized sheet works are well employed, and the inland demand for slab zinc is rather high, owing to a similar activity there and the demand for brass in other trades. The tendency of the local plants is to reduce production costs by the installation of more modern equipment and the utilization of byproducts.

Useful Operating Ideas

Pulp-Density Indicator and Recorder

By H. R. Banks and C. A. Remington
Metallurgist and Testing Engineer, Sullivan Concentrator, Kimberley, B. C.

Recently there has been developed at the Sullivan concentrator of the Consolidated Mining & Smelting Co. of Canada, a pulp-density indicator and recorder which is proving very useful in flotation control. By means of the inclined scale, shown in the accompanying illustration, instantaneous readings can be taken and the Bristol recording pressure gage provides a chart showing the variations in density of flotation feed pulp throughout the twenty-four hours. The instrument can



Pulp-density indicator

be arranged with the inclined scale for the use of the operators, and the recording device placed at some point distant from the machines, where it will be convenient for the use of foreman or superintendent.

The present instrument is based on a type of density indicator proposed by Prof. H. E. T. Haultain, of the University of Toronto. The accompanying figure will illustrate the principles employed.

In the illustration, A represents the pulp receptacle with pulp entering through the curved pipe and continuously overflowing. It is a 6-in. pipe, 20 in. long. A submerged tube extends to approximately 18 in. below the overflow lip of the pulp receptacle. At B there is a capillary tube which allows air to enter the submerged tube, and this air bubbles out from the bottom of it through four $\frac{1}{16}$-in. holes drilled into the pipe.

A Bristol recording pressure gage, Model 11, is represented at D. This has a pressure range of from 12 to 18 oz.

An automatic pressure release is indicated at C to protect the pressure gage in the event of a choke-up causing air pressure to rise above the range of the gage. Pressure recording is that required to overcome the pulp head equal to the submergence of the tube plus the friction in the air line. The gage has been calibrated empirically to take care of air line friction and other small factors, and the recorded densities check the densities obtained from actual weighings. The 12-oz. dead pressure is the approximate equivalent of the submergence.

Precipitation and Refining at Tonopah Extension Mill

By H. A. Burk
Metallurgist, Tonopah Extension Mining Co., Tonopah, Nevada

The former method of precipitation of cyanide solutions at the Tonopah Extension Mill, Tonopah, Nevada, was by zinc shavings in zinc boxes, and the refinery practice consisted in melting the dried precipitate in Monarch-Rockwell furnaces. Consumption of zinc shavings was about 0.9 lb. per pound of gold-silver bullion recovered. The average grade of the dry precipitate was 65 per cent gold-silver, and the flux required to melt it was 10 per cent borax glass, 7.5 per cent soda ash, and 5 per cent silica sand. The ratio of silver to gold in the precipitate was about 100 to 1.

Improved methods of precipitation and refining were adopted about a year ago. Precipitation is now effected with zinc dust, and the precipitate is collected by the Merrill vacuum-leaf system. It is refined, without preliminary drying, by melting in a reverberatory furnace. Consumption of zinc dust is 0.64 lb. per pound of gold-silver bullion recovered. The average grade of precipitate is about 90 per cent gold-silver, and the flux required is 1.5 per cent borax glass, 1 per cent soda ash, and 2 per cent silica sand.

Under normal conditions, 500 tons of ore are treated per day, and about 1,500 tons of solution are precipitated. The solution consists entirely of the filtrate from the Butters filters, no circulating mill solution being precipitated. It is clarified by filtration through vacuum-leaf filters of the Butters type, and delivered into a storage tank 24 ft. in diameter by 7 ft. in depth.

The solution is then drawn continuously from this tank by a No. 4 Krogh centrifugal pump, submerged in solution to prevent access of air at the pump gland, and is discharged through two 3-in. float-regulated, Merco-Nordstrom valves into a two-compartment Merrill vacuum-leaf precipitating vat. This vat is constructed

of reinforced concrete, each compartment measuring 6 ft. 8 in. in cross-section by 9 ft. 6 in. deep. In each compartment there are 18 vacuum leaves, 5 ft. high by 6 ft. long, suspended about 2 ft. below the top of the vat. These leaves are of somewhat different construction from the usual Butters type. They have the customary supporting framework of ¾-in. pipe, but are covered with burlap, instead of canvas, into which are sewed corrugated filter strips. Two thicknesses of light sheeting over the burlap complete the filter. The sheeting lasts about nine months.

Precipitation is with zinc dust, which is fed from slow-moving belt conveyors into auxiliary concrete compartments, integral with the precipitation vat. The zinc dust passes with the incoming solution into the leaf compartments near the bottom. Precipitate is kept in suspension in each compartment by means of a Devereau type of propeller, 24 in. in diameter, fixed to a vertical shaft making 110 revolutions per minute.

In one compartment, sufficient zinc dust is added to precipitate the solution to as near a "trace" silver as possible, the average result being 0.04 oz. silver per ton. In the other compartment, less zinc dust is used and the precipitated solution usually assays about 0.02 oz. silver per ton. Precipitated solution is drawn through each set of 18 leaves and discharged into 24 by 7 ft. redwood tanks by a No. 3 Krogh centrifugal pump, which maintains a vacuum of about 22 in. Motors supplying power to these pumps are provided with a float-switch control, which keeps the leaves always submerged under several inches of solution, thus avoiding exposure of the precipitate to aeration and re-solution. The nearly "barren" solution, which is about one-third the total volume of solution precipitated, is used as filter press wash; and the partly precipitated solution is pumped to battery storage tanks for re-use in the stamp mortars on incoming ore.

The foregoing assay results on the precipitated solution cover a period of nine months previous to the installation of the "Crowe" process for de-oxygenating the solution prior to precipitation. During this period it was found impossible to precipitate to a "trace" silver, even when as much as 15 per cent excess zinc dust was added. For the last two months, the "Crowe" process has been in use and improved precipitation has been obtained. The "barren" solution frequently shows a "trace" of silver, with but 2.5 per cent excess zinc in the precipitate.

Clean-up of the precipitate on the filter leaves is made twice each month, the procedure occupying two men about four hours. Each leaf is raised slowly, by chain-hoist suspended from an overhead trolley, and is hosed off with solution into the precipitate compartment by a man on each side of the leaf. The bottom of the compartment is bowl-shaped, with a 4-in. pipe exit at the center of the bowl. The precipitate is pumped from the bowl into two redwood tanks, 10 ft. diameter by 3 ft. high, each equipped with a false bottom, blanket and canvas covered. Excess solution is drawn through the canvas and returned to the precipitate compartments by a small vacuum pump. The precipitate, containing 25 per cent moisture, is sent to the refinery.

The moist precipitate is fluxed with borax glass, soda ash, and silica sand, and is melted in a reverberatory furnace. This furnace is built of firebrick, inclosed in a cast-iron shell, and is fired with crude oil at 30 to 40 lb. pressure. The hearth is 4 by 6 ft. in cross-section, by 18 in. deep.

When the precipitate is entirely melted, usually about four hours after charging, the drawbar is pulled out and the molten bullion runs into molds each holding about 2,000 oz. of metal. They are shipped to the Selby smelter.

The average fineness of the bars is 966 doré, of which 9.7 parts are gold. The precipitate (dry) assays 90 to 94 per cent doré. Consumption of zinc dust was 0.644 lb. per pound doré for the six-month period preceding the use of the Crowe process, and for the last two months since using the process it has been 0.52 lb. per pound doré. An analysis of the average precipitate from the partly precipitated circuit for a six-month period is as follows:

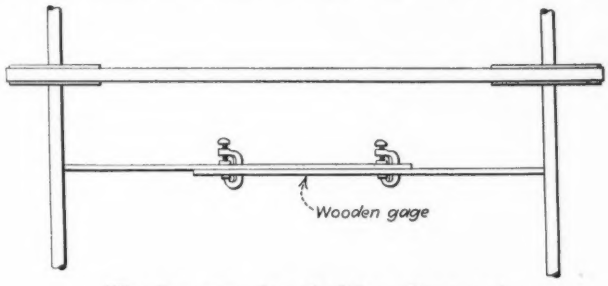
	Per Cent		Per Cent
Gold	0.8113	Lead	0.35
Silver	92.552	Calcium oxide	0.31
Zinc	2.50	Cadmium	0.16
Selenium	1.12	Iron	0.10
Insoluble	0.55		
Copper	0.38	Total	98.83

The selenium is probably a constituent of the ore, and, being soluble in cyanide solution and precipitable by zinc, it collects in the precipitate. Cadmium is present in small percentage in the zinc dust, and, as it is insoluble in cyanide solution, it remains in the precipitate. Lead in the precipitate is accounted for by its presence in the zinc dust, and in small amount in the cyanide solution, as a result of using a soluble lead ore in the treatment process.

Method of Shafting Alignment

By W. F. Schaphorst

An excellent and inexpensive home-made gage for aligning shafting is shown in the accompanying figure. The gage consists of two pieces of light, slender, stiff, wooden pieces and two clamps. With a gage like this,



Wooden gage for shafting alignment

clamped to the correct length, it is a simple procedure to check up two shafts and determine whether or not they are parallel. If in need of alignment, the gage will touch only at the points of minimum distance. Thus, if the shafts are not parallel the distance between them will not be the same along the entire length, but if the shafts are parallel, the gage will "just touch" at both ends and at every place of measurement.

A wooden gage of this kind is obviously superior to a cord, because it does not stretch or shorten. It is handled with greater ease and certainty and is even better than a steel tape.

Where much shafting is used it is worth while to make a gage of this kind to keep on hand for use as a permanent tool. Fitted with a tongue-and-groove joint the two pieces are adjusted more quickly than without such an arrangement. However, two plain sticks without the grooved joint will serve the purpose very well in an emergency.

Discussion

Genesis of Sulphide Ores

THE EDITOR:

Sir—In replying to the comments by Messrs. Hixon, Platts, Carpenter, and Draper on my article on the "Genesis of Sulphide Ores," and your article on "Alkaline Sulphides as Collectors of Metals," I again wish to present chiefly the argument of the chemist while not disregarding what appear to be certain accepted geological factors.

To Mr. H. W. Hixon I would say that if volatile chlorides are called in to explain ore deposition, according to his statement *all the ores now existing as sulphides* were present as chlorides in the original earth mass and have since been sublimed from it. Therefore, they previously must have condensed into it. Then again he says they are concentrated under the conditions where water is formed from steam. If he means that they were concentrated by virtue of solution as chlorides and precipitation by H_2S, then he must explain how zinc chloride could travel with, accompany, and be precipitated under virtually the same conditions as lead chloride and in similar masses. His explanation must extend to all the metals now found as sulphides, including nickel, copper, cobalt, iron, zinc, cadmium, lead, silver, arsenic, antimony, manganese, and molybdenum as well as gold. These all must have condensed into the underlying mass, have all revolatilized from it as chlorides, have permeated the rocks upward into the region of water, have dissolved in the water, and have been precipitated from a mutual solution (and alkaline at that) by H_2S, often at the same time and place as one another and as the accompanying gangue. This the chemist cannot accept.

In "The Ore Magmas" you commence by saying that whatever will explain the close association, in veins, of quartz and metals will illuminate ore deposition. The same thought occurred to me and doubtless to many others, from chemical considerations alone, before the words came to my attention. It was this close association of various metallic sulphides which caused me to keep my eye open for some property which they might possess in common. A large number of metals are found in nature as sulphides. The majority of these melt at above 1,000 deg. C. I found that *all* natural sulphides can be fused at low temperatures (all below 700 deg. C. and some very much lower) by combining them with molecular proportions of anhydrous sodium sulphide. Also, all these double sulphides separate from siliceous fusions containing them, with great facility. Next they are all affected by water, some, as pointed out in my article, separating into simple metallic sulphides and sodium sulphide in aqueous solution and others dissolving in the water as double sulphides. Here we have more than one property in common for all the sulphides through the igneous fusion stage and until the contact with water. The contact with water divides them into two classes chemically and physically. These classes correspond very closely with the geological grouping. When we come to the finer distinctions within these groups, we find signs of further agreement between the chemist and the geologist as evidenced in the differences between the manner in which copper and nickel-sodium sulphides react with water as compared with zinc, iron and lead-sodium sulphides, and in the differences noted by the geologist in deposits of copper and nickel as compared with deposits of zinc, lead, and iron. We also find in these reactions the means for the formation of metallic sulphide gels and plastic masses. If further evidence were needed, the reactions of sodium sulphide with siliceous material in the states of igneous fusion and aqueous solutions supply it. Here I am answering Mr. J. B. Platts. Let him finely powder some silica and heat it with an aqueous solution of sodium sulphide, then filter the solution and allow it to oxidize and carbonate and then observe the silica gel which separates. I see no difficulty in accounting for replacement by aqueous sodium sulphide and by the sodium carbonate which results from it under certain conditions. There is nothing to prevent the intrusion of these solutions and mobile gels into the microscopic openings he refers to. My theory depends on the action of water on the dry sulphide eutectics, then of the action of precipitants such as carbon dioxide.

Answering Mr. Hixon's question about the reaction

$$Na_2S + H_2O + CO_2 = Na_2CO_3 + H_2S$$

I must explain that this reaction is always complete when the gaseous product of the reaction can escape. Until this condition obtains we would have sodium sulphide, metallic sulphide, water, carbon dioxide, and sulphuretted hydrogen in equilibrium at high pressure. Under this condition only a partial precipitation of ore could be effected. Such a mass in equilibrium would be forced upward into regions of reduced pressure, and there, if sufficient carbon dioxide were present, the equivalent sulphuretted hydrogen would escape and more ore would be precipitated. I submit that this is logical chemistry and that it fits in with the deductions of the geologist.

I lay great stress upon the function of water in these reactions, but note that you (Mr. Spurr) use the term "relatively dry" in your commenting article. Water must always have been present but not always abundant. Some orebodies have undoubtedly been in the form of thick sludges or slimes intermixed with silica gel, so thick as to support pieces of wall rock sometimes denser than they, until consolidation held them permanently. I am not a geologist, but I dispute Mr. Nixon's contention that reduced density due to gases is the only force propelling the ore magmas. We can call in transmitted pressure and we are not concerned so much with the density of the ore magma as with its viscosity and the rate at which it loses this viscosity. My conception is that, after intrusion, the magmas often very rapidly lost their water, as they

were the points of highest pressure in surroundings of lower pressure. They would lose the water much as a sponge when squeezed. Then, irrespective of density, they could hold detached rocks in place during periods of crystallization.

Referring to your comment on the regional isolation of realgar and stibnite, and the absence of these in regions containing complex ores with arsenic and antimony, I think this is explained by the insolubility of the complex compounds in aqueous sodium sulphide and by the solubility of the simple arsenic and antimony sulphides in the latter. Therefore, the simple sulphides would be the end differentiation product of the magma, would travel farthest and be precipitated in favorable locations (points of abundant CO_2). They would probably, of all the products, have contained the most water.

Regarding the presence or absence of sodium sulphide in the surface rocks and waters today I think that it has been well demonstrated that this is an extremely unstable compound under surface conditions, although it has been found in a few locations. Its products, according to my theory, would be sodium carbonate and sulphate. These are abundant in magmatic waters and may have been much more so.

Answering Mr. Carpenter, I am glad to accept his figures for the melting points of pure sulphides. I quoted round figures only and used the word "approximate." His figures serve to emphasize still further the great reduction in melting point brought about by sodium sulphide. I may say for the benefit of those who may be checking the melting points of the double sulphides that pure anhydrous sodium sulphide is unknown. It was my attempts to prepare it by reducing pure sodium sulphate by pure carbon in the electric furnace, and my inability to melt the product, that led me to investigate these eutectics and to develop a method of making 90-95 per cent Na_2S in a fused condition—a process which has been put into commercial operation. This product was used for the experiments with the double sulphides, and the melting points obtained checked approximately with those obtained by dehydrating sodium sulphide crystals.

Answering the letter of Mr. L. L. Draper, I must say that the long-known occurrence of water and liquid carbon dioxide in vein and veindike rocks serves strongly to confirm the action of carbonic acid as a precipitating agent under conditions of pressure and abundance. It would be interesting to hear of inclusions of liquid or gaseous sulphuretted hydrogen in such rocks. I think the evidence points to an excess of carbonic acid eliminating the latter.

It is unfortunate that Mr. Draper has not read my article so as to understand that the theory involved requires the action of water upon the sulphide eutectics to explain the phenomena of ore deposition. I agree with Mr. Spurr when he says that deposition of sulphides has taken place below 500 deg. C., and I am in further agreement with those who require lower temperatures. It is in this range that water could have performed its action upon the double sulphides. In fact, temperatures down to less than 100 deg. C. are allowable by my theory.

With regard to the presence of native metal in primary veins, it is easier to explain this by the reduction of weak compounds and those of low heats of formation (sulphides) than by the reduction of strong compounds and those having high heats of formation (chlorides). Thus, AgCl has a heat of formation of 29,000, while Ag_2S has only 3,000. $CuCl_2$ has a heat of formation of 51,400; CuS only 10,100. We have only weak reducing agents available and we know that the sulphides are much more readily reduced than the chlorides, particularly at temperatures below 500 deg. C. It may be found that at temperatures around 300 deg. C. carbon dioxide could reduce sulphides of silver and copper and, more probably, gold.

The objection to a universal solution containing chlorides of all the metals now existing as sulphides I have already given. Mr. Draper attempts to overcome this by including in the same solution borates, sulphides, and carbonates. No one has yet prepared such a complex solution in the laboratory and precipitated from it a mixture of metallic sulphides, quartz, and other gangue minerals, in any way resembling the contents of a vein. This may very easily be done with the alkaline sulphide reactions which I have mentioned.

It is difficult for a chemist properly to combat the arguments of many geologists, who speak in broad generalizations in dealing with a science that even yet finds its greatest strength in the field of logical deduction. It is, therefore, extremely important to verify each step in thought and particularly to use more precise terms than, for instance, "acid complex vein forming solution" and "mineralizing solutions." These terms do not tell us how the quartz is to be dissolved in such solutions, and they do not give us a specific description of the manner in which a quartz vein has been precipitated, whether it contain metals or not.

I note that, in referring to the order of deposition, Mr. Draper calls in the solvent action of excesses of hydrogen sulphide and the soluble sulphides. The latter must include alkaline sulphides. In such case how have they been formed? His reference also to the acid and alkaline reactions of the vein solutions calls to mind that the solutions could be very strongly alkaline, in the geological sense, by containing sodium carbonate in the presence of a large excess of carbon dioxide (this would be acid sodium carbonate to a chemist), and yet this carbon dioxide could be capable of robbing the wall rocks of basic elements.

Shawinigan Falls, Quebec. HORACE FREEMAN.

The Microscope in Milling and Flotation

THE EDITOR:

Sir—The use of the high-power microscope and accessories has been neglected in the art of milling ores in the past. European scientists, chemists, and analysts have developed, particularly in Germany, a fine science and technique of micro-analysis that we in this country would do well to follow and study. Especially is the field applicable to flotation and milling in general. We cannot hope to produce or procure results from some ores, try as we will, by any known methods, but an instant's examination under proper illumination under the microscope will show gangue and mineral, spider webbed and distributed so finely that a grinding through 200 mesh could not segregate them.

Another phase of microscope use is that of estimation of various percentages of any one constituent or mineral in an ore or mixed salts of some mineral, which ordinary methods of assay do not reveal. Just as the clinic technician counts the corpuscles in our blood stream by means of a ruled slide, so may our mill feed be counted to determine its quality and components.

Phoenix, Ariz JAMES BROWN.

News of the Week

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Summary

FRAUD ORDER issued by Post Office Department against Lightning Creek Gold Gravel & Drainage Co.—Fall River Mining Co. sues Post Office Inspector.

Promontorio Mine, Durango, Mexico, completes 125-ton mill—Applications for Mexican mining patents number 3,117 in 1925.

Idaho Commission upholds former ruling that "tailings" is low-grade ore—Custer County, Idaho, mines active.

Gold dredging in Guatemala a financial success—Chile copper loses case involving capital stock tax—Hollinger increases milling capacity; replaces stamps by rod mills.

Alaska Juneau operates at a loss in February—Cold-water thawing lengthens dredging season from four to six weeks—Old placers reworked by modern equipment.

Lead mining in Derbyshire reviving under stimulus of recent prices—Rumanian gold mines subject of intensive exploitation.

Platinum yield from Onverwacht plant not in keeping with high price of shares.

Quebec mines yield $22,497,792 in 1925; $18,952,896 in 1924.

War minerals bill now in Congress for liberalization.

Injunction to Prevent Merger of Ray and Nevada Companies Denied

The application to continue an injunction which since last November has tied up the meetings of stockholders of the Ray Consolidated Copper Co. and the Nevada Consolidated Copper Co. to vote on a proposal for merger was denied on March 24 by Justice Levy of the Supreme Court of Maine. The restraining order had been obtained by Frank C. Armstrong in behalf of himself and other stockholders of the Ray company.

Armstrong sued to prevent the transfer of the Ray assets to the Nevada company in return for 3,077,179 shares of stock and the assumption of the Ray company's debts by Nevada. He alleged that the Ray stockholders would be cheated and defrauded in the merger. The directors of both companies recommended the consolidation to their stockholders, and meetings of both to pass on the proposal were called for Nov. 10 last. These meetings have been adjourned pending the decision in the case.

In concluding his opinion, Justice Levy says that the stock of each company has sold at about the same price on the market. He points out that the plaintiff, under the laws of Maine, where the Ray company was organized, may have his stock appraised there at its actual value and redeemed by the Ray company if he is not satisfied with the merger.

Iron Ore Shipments Begin

The Armour No. 1 mine, Cuyuna Range, Minn., has sent the first train of iron ore for the season to the Soo Line dock at Superior, Wis. Other Cuyuna range mines are expected to ship to the docks at an early date.

Much disappointment is felt in mining circles over the failure to raise ore prices. Decision is thought certain to restrict the season's shipping activities largely to the Oliver Mining Co. and independents with furnaces. Few other mine owners are making any move yet to start mining for the season. Some regard state tonnage tax as a boomerang for its political promoters, through increasing ore costs.

Red Lake recording office, with the first certificate of record issued

Calumet & Hecla Tailings Yield Handsome Profit

Since 1916, when the Calumet reclamation plant went into operation, there has been reclaimed from tailings a total of 121,007,924 lb. of refined copper, which has netted the company close to $10,000,000 in profit. The metal has cost approximately only 7c. per pound to produce. In its seven and a half months of operation, the new Tamarack plant, about half the size of the Calumet unit, has produced 6,679,000 lb., returning a profit of nearly a half million dollars.

In treatment of the sand, copper losses have been considerably reduced. The loss per ton of sand treated was only 1¼ lb. last year. The Calumet plant recovered 9.54 lb. per ton last year, compared with an average of 10.28 for the ten years of operation. In 1925 the company made a new high record of production, treating 2,125,000 tons of sand and recovering 20,278,000 lb. of metal. The sand varies from year to year according to the location of the dredge. It is estimated that the Calumet deposit is good for twelve to fourteen years more, and the Tamarack deposit should last equally as long. Regrinding of the coarser sand, table treatment, ammonia leaching, and oil flotation are employed in the recovery of the copper, bringing the total recovery of the metal content of the conglomerate lode as mined up to over 98 per cent. The sand is removed from the lake by means of a suction dredge.

The company reduced mine costs 1.22c. per pound in 1925, and reclamation costs, 0.77c. per pound. The company received 1.18c. more per pound for its copper than in 1924, making a net difference of 2.4c. per pound.

Quapaw Lease Held Invalid Because of Indefinite Period

The lease obtained by W. P. McCullough and others on Indian lands in northeast Oklahoma for the purposes of mining lead and zinc was declared invalid by the United States Supreme Court on March 22 in favor of later leases on the same lands given Wesley M. Smith. The McCullough lease was given for ten years, or as long as minerals could be recovered in paying quantities. That granted Smith was for a definite period of ten years. The Federal district court originally decided that the McCullough lease violated the act of Congress limiting mineral leases of the Quapaw Indians to ten years and dismissed the suit, but the circuit court of appeals reversed the case, holding that the original lease was valid for the ten-year period, but no longer. On retrial, the district court held in accord with this decision, and the circuit court of appeals sustained the case. This latter decision reached the Supreme Court. Speaking for the Court, Justice Van Devanter held that the McCullough lease, being for an indefinite period, was entirely void, and the decision of the lower courts was reversed.

Britannia to Drive 6,300 Ft. Haulage Tunnel

The Britannia Mining & Smelting Co., the British Columbia subsidiary of the Howe Sound Co., has decided to drive a main haulage tunnel, 6,300 ft. long, on the 2,700 level. The work is expected to be completed in a year. It will eliminate a large amount of outside railroad yard and the concommitant labor of clearing the tracks of snow during normal winters, and in this way will materially reduce cost of operation.

The company has relinquished its option on the group of claims near Squamish, the southern terminus of the Pacific Great Eastern Railway.

Improvements at Lake City, Colo.

M. B. Burke, president of the M. B. Mining Co., says that he will spend about $200,000 for improving conditions at the Ute and Ulay mines, near Lake City, Colo. There exists a body of lead and zinc ore that has a large value, but which was passed over in the early days. New processes will now enable the company to treat this ore.

A new concrete dam across Henson Creek has been completed, and with the installation of a power plant the total cost will be $75,000.

Napoleon Group to Be Placed on Production Basis

The Napoleon group of mines, at Pitkin, Colo., owned by Mrs. Charles Sutton, of Denver, has been taken over by the Napoleon Mining & Leasing Co., and development work started. The officers of the new concern are Charles C. Thayer, president, and John Fikani, vice-president. Claude Smith is manager.

Dome Mines Exploring at Depth

Explorations on deep levels of the Dome Mines, in the Porcupine area of northern Ontario, have produced encouraging results. The work has been in connection with the lower sedimentary rocks, and with a view to finding whether the underlying basic rocks contain fractures or veins.

Tonopah Belmont Plans Mill at Hamilton, Nev.

Plans are being made by the Tonopah Belmont Development Co. to install a pilot mill at Hamilton, Nev., about 60 miles west of Ely, where the company is carrying on development in the silver-lead belt west of Treasure Hill. Reports of Charles Mayotte, superintendent, show that enough ore is already on hand to justify the building of a small mill.

Clifton Smelter Conducts Experiments to Produce Pure Copper

EXPERIMENTS are being conducted, under the direction of J. O. Ambler, superintendent of the Clifton smelter of the Phelps Dodge Corporation, which have as their object the production, at the smelter, of a grade of copper so pure that it can be shipped direct to the manufacturers of copper products without refining. Experiments of this nature are said to have been conducted successfully, and the process is now to be attempted on a larger scale. Colonal H. H. Stout, the corporation's consulting metallurgical engineer, has gone to Clifton to assist Mr. Ambler with the experiments.

Iowa-Tiger Changes Hands

R. P. Ralston, of Denver, president of the Colorado-Mexico Mining Co., and associates have purchased the Iowa-Tiger mining properties in Arastra Gulch, near Silverton, Colo. A new 500-ton selective flotation mill will be installed and operated under the name of the Colorado-Mexico Mining Co. G. R. De Beque and M. L. Ralston are other members of the new concern.

Noranda Increases Ore Reserves

It is stated that a new and important discovery has been made at the Horne mine of the Noranda company, but no details are as yet available. Developments, however, on the E orebody are exceeding expectations, and it is now stated that the gross value of the ore reserves above the 300 level amounts to between $35,000,000 and $40,000,000. Noranda stock is now selling ex rights. The shareholders have the privilege of taking up one share for each ten shares held at $10 a share, the option to expire on April 12. It is reported that 125,000 shares of Noranda stock has just been distributed to the Tremoy Lake Syndicate, under the terms of the purchase agreement.

Washington News

By Paul Wooton

Special Correspondent

Senate Committee Agrees on Liberalized War Minerals Relief Bill

A bill liberalizing the War Minerals Relief Act has been agreed upon by the Senate Committee on Mines and Mining, and has been reported favorably to the Senate. The bill would repeal that phase of the existing law which makes the decision of the Secretary of the Interior conclusive and final in the handling of claims and would allow appeals from his decisions to the Court of Claims. The new bill also directs the Secretary of the Interior to reconsider his findings or payments and make awards for net losses incurred in connection with the purchase or lease of property and for interest on borrowed capital.

Senator Oddie was authorized to write the report for the committee. In his report the Nevada Senator points out that the War Minerals Relief Act was a part of the so-called Dent Act of March 2, 1919. Claimants under one part of the act, providing for relief in cases of contracts, allows recourse to the Court of Claims, but no such privilege is allowed the claimants under the War Minerals section.

Senator Oddie points out that "there is no reason to believe that it was the intention of Congress to make a distinction in the same act between those citizens who co-operated with the War Department and those complying with the solicitation or demands of the Interior Department."

Unless all claimants are placed on a parity, attention is called to the fact that Congress, rather than the courts, will be called upon to pass upon a large number of private claim bills.

After reviewing the history of War Minerals legislation the report says:

"It long has been a settled question that discretion, judgment, and authority vested in a particular administrative officer by an act of Congress cannot be delegated. It would seem too obvious for argument that the manifold duties of the Secretary of a great department of the government like that of the Interior Department would physically preclude the giving of his personal attention to matters of this character. Therefore, it is desirable and proper that, if authority must be delegated in the matter of deciding questions of law, it should, in the interest of legally safeguarding the rights of claimants and of efficient administration, be delegated by Congress; and it also seems desirable and proper that in the delegation of such authority, it should be vested in an agency which will determine the issues involved in accordance with the usages and practices of law and equity, that is, in a court. That such matters, in the opinion of Congress, were intended to be decided in this instance under well-known and long-established legal and equitable principles, is evident.

"The passage of this bill will not

result in any undue or extended litigation, in the opinion of this committee. It is believed that very few cases will go to the court, and that the very few which may go to the court will be in a nature of test cases. The committee is also of the opinion that the enactment of the legislation recommended herein will entirely relieve Congress of future requests for additional assistance to the claimants under the various acts relating to the production of war minerals."

Red Lake Appraisal at Washington

Information from Canada reaching mining engineers in Washington, D. C., leads to the general conclusion that the Red Lake discoveries are of great significance. Taken in conjunction with finds across the line in Manitoba, it is apparent that a large and promising area has been opened to the prospector and that the frontier of mining in Canada has been pushed a hundred miles further north.

The opening of a new mining district in Canada, it is pointed out, is of moment to the United States. It means employment for American mining engineers and other types of skilled workers. Most of the equipment being used in the prospecting period and the machinery likely to be needed later comes from the United States, and a part of the other supplies also comes from the United States side of the border.

Another probable benefit to the United States is that the activity in northern Canada will acquaint many more prospectors with northern conditions. The probabilities are that many of these men eventually will find their way to Alaska, where the future of the territory depends, to a very considerable extent, on the discovery of mineral deposits that can be worked at a profit.

Noxious Gases in Cripple Creek Mines

After lecturing in Denver and Golden, Dr. A. C. Fieldner, superintendent of the experimental station of the U. S. Bureau of Mines, Pittsburgh, went to Cripple Creek to study gases in the mines of the Cripple Creek district, and before leaving for Pittsburgh he conferred with C. W. Henderson, engineer for the Bureau at Denver. As a result of Dr. Fieldner's investigation, E. H. Denny and R. J. Marshall, two engineers of the Denver office, will go to Cripple Creek and study the conditions. Dr. Fieldner says:

"The gases in the Cripple Creek mines emanate from the rocks. They contain carbon dioxide and nitrogen, but are low in oxygen. The Bureau is attempting to find out how to eliminate these gases and what to do when miners are caught in them. When a candle goes out, it is considered a two-hour warning to men to leave the workings. These gases may be the result of simple absorbing of air by rocks and exuding it again, minus the oxygen, or they may be of ancient volcanic origin. The Cripple Creek gas conditions are of very rare occurrence."

Post Office Department Issues Fraud Order in Sale of "Gold Bullion Warrants"

THE operations of the Lightning Creek Gold Gravel & Drainage Co., Ltd., and the Mines Operating Co., which has a property in the Cariboo district of British Columbia, under the direction of Charles H. Unversagt, with offices in Vancouver, B. C., Seattle, Wash., and New York City, have been the subject of an investigation by the United States Post Office Department and as a result have been denied the use of the mails for mine-promotion and stock-selling purposes. The complete text of the Post Office solicitor's ruling was published in the *United States Daily*, March 20, 22, and 23, 1926.

In 1901 Unversagt began to acquire stock in the Lightning Creek company, and in 1902 organized the British American Gold Mining & Trading Co., to take over the stock of the Lightning Creek company. From 1901 to 1910 Unversagt organized several other companies, among which was the Great Cariboo Gold Co., incorporated in 1903. The stocks and bonds were sold to the public. In 1910 he organized the Mines Operating Co. with a capital stock of 1,200,000 shares, par value $5 each. The Mines Operating Co. entered into a contract with the Lightning Creek company, whereby the operating rights were vested in the Mines Operating Co. Promotion literature containing extravagant claims and misleading statements was circulated through the mails. Quotations follow:

"The values are definitely established. There is no risk of loss. The stated profits are sure . . . This property now represents $1,500,000 expenditure and has a $12,000,000 net gold reserve in but one of the fourteen sections to show for this money. . . . Thus every dollar put in the work so far shows a proven net earning of $8. . . . On that basis when the whole property (fourteen sections) is tunneled out, each of these dollars would receive $112. . . . Loss impossible, because the company now has $12,000,000 known and proved security as a guarantee for the $300,000 or $40 for each dollar which may be paid in on Bullion Warrants."

Then follows "twenty-five facts and points" of equally unenlightening and misleading statements.

The prospective investor is informed that the company owns gold against which it sells bullion warrants, agreeing to deliver at a future date a certain quantity of gold bullion. The promoter does not want to sell stock, as he considers the gold as merchandise about ready to deliver to the buyer. He argues that it is better to own actual gold than a stock certificate. A bullion warrant guarantees the purchaser an exclusive ownership without being subject to control of others as in case of stock certificates. "The warrant for bullion is a specific title to you that the company will deliver free of all expense" a certain number of ounces of gold. "The plan is just as simple as the purchase of any kind of metal at a certain price and disposing of it at an increased price. This gold has been definitely determined by methods which are employed throughout the world:"

Has the gold really been determined? The Post Office Department does not think so. A few test holes have been drilled purporting to show certain gold values. The promoter estimates that 90 per cent of the gold recovered will be net profit and deliverable to owners of the "bullion warrants." This promotor has been on the job twenty-four years on the same property, and as late as 1923 the evidence shows that he obtained at least $50,000 through the operations of the Buffalo-Cariboo Syndicate. He admits that during the period of twenty-four years in his handling of this property he has taken from the public in excess of $1,500,000. The Post Office Department finds from evidence in the case that the mine production in twenty-four years is only $150. His promotion literature, according to evidence submitted, contains garbled statements of the Canadian geologists, and tirades upon various government officials advising his clients that the government agents were trying to steal their property and that he must have more money with which to protect their interests.

Fall River Mining Co. Sues Post Office Inspector

The Fall River Mining Co., Denver, Colo., of which C. J. Morley, Governor of Colorado, is president, brought suit in the District court at Denver on March 22 against Dennis C. Hudson, a United States postal inspector, asking $50,000 damages. It is alleged that Hudson opened the company's mail and communicated with the customers, asking if they were satisfied; that he did this to wreck the company. Just previous to this action the authorities arrested some brokers and among those were some who had sold one million shares of Fall River Mining Stock, but who did not own the stock.

The company has also brought suit for $50,000 against Thomas Henahen, a deputy mining inspector, accusing Henahen of conspiring with others to ruin the company and alleging that Henahen has sent out false statements. The *Denver Post* has for some time been printing articles which are to the effect that the Fall River Mining Co. does not own the property that it is working, and questions the general methods being used to finance it.

Utah Delaware-Utah Apex Agreement

An agreement between the Utah Delaware Mining Co. and the Utah Apex Mining Co. eliminates disputes over title to ownership of orebodies of either company within the vertical boundary lines of the other, located in Bingham Canyon, Utah. To this agreement the International Smelting Co. and the A. S. & R. Co. have also agreed.

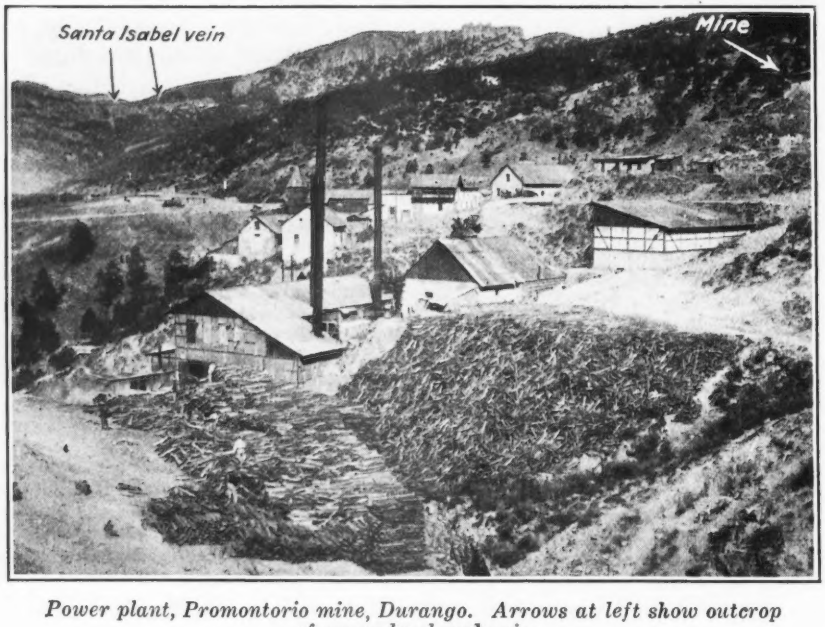
Promontorio Mine, Durango, Mexico, Completing 125-Ton Mill

By Homer C. Coen
Durango, Mexico

THE Compañia Minera Explotadora de Promontorio, S. A., which has taken over the Promontorio mines, in the San Francisco Mountains about 20 miles northwest of Chinacates, in the State of Durango, has about completed its new 125-ton flotation mill and expects to have it in operation in May. Snow, rains, and generally bad weather, which are an unusual condition in Durango during the dry or winter season, caused considerable delay in transportation of the heavier pieces of machinery. This year's winter weather was so unusual that the men, unaccustomed to rain and snow, could do nothing.

The Promontorio mines have been known and worked for more than a third of a century, and much silver has been extracted from the bonanza shoots. A large quantity of low-grade milling ore is still in place. The mine has been worked to the fourteenth level, but the principal workings are at the fourth and eighth levels, which will furnish sufficient ore for the present mill.

What is known as the Santa Isabel vein has never been touched, except for a little exploration work for sampling it, but it shows indications of as rich milling ore and as great quantities as the original Promontorio vein.



Power plant, Promontorio mine, Durango. Arrows at left show outcrop of an undeveloped vein

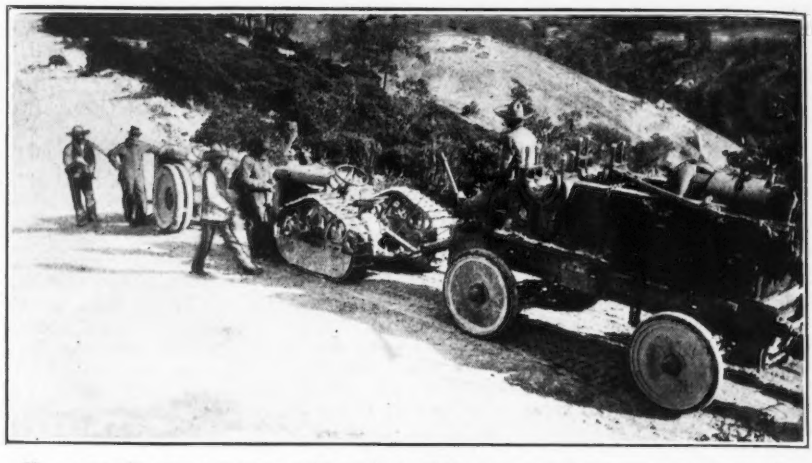
The mine is reached by automobile road from Chinacates, on the Tepehuanes railroad branch out of Durango. The first ten miles of the auto road is across a level, grassy valley, but the last ten miles is along the mountain side, past deep canyons, and through the pass of the San Francisco range at an elevation of 9,300 ft. above sea level. It then descends quickly into a pocket which is the head of the canyon on the northern end of the range, where the camp and mine are situated, at 8,400 ft. elevation.

Owing to the recent disturbed political conditions, the Promontorio plant had to be shut down, making it necessary for the owners to work only the high-grade shoots in a desultory way, and finally it closed down completely. During the last two years the new company has had charge of operations, and it was decided to construct an entirely new mill close to the mine, so that handling of ores would follow modern practices.

An old steam power plant of 150 hp., with direct-connected Westinghouse generator, has been retained and furnishes power for compressors and the hoist, and a spare Corliss engine of 100 hp. has been added to the equipment; and the 150-hp. Koerting gas-producer plant (charcoal), with generator, has been brought from the old mill and is being installed to handle the motors at the new mill, which is so constructed that there will be no hand labor in handling the mine products. All power will be furnished by separate electric motors to each unit of the mill.

Ore is delivered from the first level of the mine in cars direct to the crushers, from which it is elevated by a belt conveyor, after screening to ¾ in. size, to the storage bin of 300 tons capacity.

Grinding is done in a 10x5 ft. rod mill, carrying a load of fifteen tons of rods. After flotation the tails will be cyanided. There is an ample supply of water from the mine and springs, with a large reservoir in the canyon just below the mill for emergency use.



Transporting a seven-ton piece of machinery over steep mountain grades, Promontorio mine

A. K. Macfarlane is general manager and Nick Donovan is the mine superintendent. Early operation of the mine and new concentrating plant is looked forward to with great interest in mining circles in Durango, because it is the most important new construction of recent years, and one of the visible demonstrations of the new confidence spreading over the state in the mining industry.

Bond Issue of $75,000 for Butte-West Side

Butte-West Side Mines Co., operating the Minnie Jane and Robert E. Lee properties in West Butte, Mont., has sent the following communication to stockholders:

"At the annual meeting of stockholders, held Dec. 10, 1925, authority was given to the officers and directors to make a bond issue to provide a treasury, for the purposes of your company, mainly for prosecuting development at greater depths and for the exploration of other veins through present workings.

"To meet the requirements of your company, a bond issue of $75,000, secured by a first-mortgage trust deed, has been made with bonds in denominations of $250 and $1,000, payable in five years from March 12, 1926, with interest at the rate of 8 per cent per annum, payable semi-annually. The bonds are redeemable by the company at any interest date at 105 and convertible, at the option of the holder, into stock of the company at 50c. per share."

Mexico City Letter

By W. L. Vail

Special Correspondent

Applications for Mining Patents 3,117 in 1925—New Mining Laws Not Yet Promulgated

According to statistics just given out from the Mexican Mining Department, there were 3,117 applications for mining patents during 1925, a number considerably in excess of patents issued in any single year for several years. Most activity was shown in the states of Chihuahua, Sonora, Durango, and Zacatecas and in the territory of Lower California. Applications for patents for the first two months of last year largely exceed, numerically, applications during the first two months of the year. From this and other reasons, the mining authorities deduce the belief that 1926 will be a banner year in the mining industry.

An important Presidential decree has been issued annulling payment of mining taxes prior to 1920 and permitting the payment of taxes for the years 1921-2-3 in the special "Employees Bonds," which can be bought at a considerable discount, if taxes for 1924 and 1925 are paid in cash. Those desiring to take benefits from this decree must do so before April 31.

The Mining Department has not yet turned over to the National Chamber of Mines the project for the new mining laws which the President has been authorized to put in force before the end of May. It is understood that the government authorities will submit a plan of proposed changes to the Mining Chamber and have requested suggestions and co-operation. One of the radical changes advocated by President Calles is that all mining properties shall be worked during the year, so as to maintain titles.

Reports from Oaxaca state that the American Smelting & Refining Co. is installing a 1,000-hp. Diesel engine. It is also tearing down the old steam hoist and installing electric-driven compressors and pumps. Plans call for a 250-ton mill. Bunk houses and cottages for married employees are already completed. The Peñoles people are getting the last of their machinery on the ground at the Natividad mine. The Electric Bond & Share Co. is building an automobile road from the camp in the Zimitlan district to the city of Oaxaca, a distance of 60 kilometers, and is installing a water and oil concentrating plant. A report was recently made on the property by Murray Coleman for the purpose of ascertaining the kind and class of mill required. Development work is being pushed rapidly in the Totoloapam district.

Gold Dredging in Guatemala

Considerable interest has been awakened in Guatemala by the large and steady production of gold by the Guatemala Gold Dredging Co. with its eight-foot all steel dredge. This dredge went into operation in November, 1924, and has been steadily operating and paying dividends ever since, having produced over $375,000 in gold to date. A cable dispatch dated March 19 gave the last clean-up as 1,140 oz. of gold, valued at $21,090; the previous clean-up of March 3 amounted to 1,138 oz., or $21,053. The clean-up of Feb. 17 was 1,616 oz., equaling $30,423, thus making a total of $70,000 in gold produced in the last six weeks. The working cost equals about $9,000 per month. This dredge was built by the New York Engineering Co. for the Guatemala Gold Dredging Co. A. C. Ludlum of New York is president of both companies.

On page 557 of this issue will be found a detailed article by Mr. Ludlum relating to this enterprise.

Approach to mine buildings from shaft house, Promontorio mine, Durango, Mexico

Chile Copper Loses Case Involving Capital Stock Tax

On March 22 the Supreme Court of the United States handed down a decision in the case of William H. Edwards, Collector of Internal Revenue, against the Chile Copper Co. This case involved the question whether the Chile Copper Co. was a holding company, or was engaged in "doing business" and therefore taxable under the Federal Capital Stock Tax Act. The Supreme Court reversed the decision of the United States Circuit Court of Appeals for the Second Circuit, which held that the Chile Copper Co. was not "doing business."

More Efficient Concentration at Trout Lake

At the Trout Lake concentrator of the Oliver Iron Mining Co. at Coleraine, Minn., a departure from the standard washing practice is being made in one unit. Crushers are being added below the rotating screen to form a closed ore circuit, reducing all the crude ore until it passes through the screen, thus eliminating the picking belt. Considerable saving is expected from those parts of the pit having thin bands of good ore covered on each side with brittle taconite. With this change and the addition of Bowl rake classifiers to four units a larger and better production is expected from the plant.

Idaho Commission Rules that "Tailings" Is Low-Grade Ore

A second hearing in the case of Harr & Harr vs. Oregon-Washington Railroad & Navigation Co. was held before the Idaho Public Utilities Commission, and on March 18 the commission upheld its former ruling. It thereupon ordered the railroad company to refund freight paid on shipments of tailings to the smelter at Bradley, Idaho. The railroad company had charged the same rate as for concentrates, when as a matter of fact the material was a lean ore worth less than $20 per ton. The commission states that "upon full consideration of all the evidence in this case, we are of the opinion that the material shipped, because of its low grade and low value, is entitled to the lowest rate offered for the movement of this kind of commodity between Osborne, Idaho, and Bradley, Idaho, to wit, 30c. per ton, and we so find." The 30c. rate is the existing charge for ore having a value of less than $20 per ton.

Custer County, Idaho, Mines Active

Henry Ford has doubled the machine drill crews on the Redbird mine in Idaho, and is continuing diamond-drilling explorations. The Twin Apex mine, 2 miles west of the Redbird, owned by Salt Lake interests, has drifted 200 ft. on a lead carbonate ore-shoot. Horseshoe mine, at Mackay, Idaho, operated by the Kay Development Co., has opened a massive body of zinc-lead ore. Livingston mine is shipping five truck-loads of high-grade silver-lead ore daily and has recently added five trucks to the fourteen already in use for the transport of the ore from the new strike to Mackay.

A lease and option to purchase the Dryden group of lead-silver claims in the Bay Horse mining district, Mackay, Idaho, has been transferred to a group of New York capitalists represented by Kirby Thomas. The property is in Custer County, 60 miles northeast of Mackay, and includes a mile of the Redbird ore zone, in which the Ford Motor company has been operating. It is in the same region as the Livingston mine, scene of a recent galena strike.

Hollinger to Increase Milling Facilities

Operations to increase the mill capacity of the Hollinger Consolidated mine at Porcupine, in northern Ontario, are now under way. Recent production of ore has been so great as to necessitate much larger outlet facilities. It is expected that by the middle of this year the plant will be sufficient to handle about 9,000 tons daily.

There are twenty-two shafts on the Hollinger property, two of which are down to a depth of about half a mile, others ranging from 1,000 to 2,000 feet. The surface plant covers an area of more than six acres, and more than 15,000 horsepower in hydro-electric energy is used. Five rod mills and one ball mill are in operation, and some of the old stamp equipment is being used, providing at present a daily capacity of approximately 6,000 tons.

Mining Notes from Alaska

ALASKA is divided into four judicial divisions, and it is interesting to compare their mineral production. No. 1, or Southeastern division, produced $2,665,730 of gold in 1925 and $293,099 of palladium. The gold production was almost entirely from the Alaska-Juneau Co.'s mines; the palladium came from the Alaska-Palladium Co.'s mine on Kasaan Peninsula, Prince of Wales Island. The latter also produced 1,016,311 lb. of copper, 1,585 oz. of gold, and 6,550 oz. of silver. With the additional machinery recently installed, the Alaska Palladium Co. estimates that the production of the mine for the current year will approach the million dollar mark. The old tailings will be re-worked. No. 2, or Nome division, produced $1,131,937 in gold. No. 3, or Southwestern division, had an output of $849,636 in gold and 79,270,808 lb. of copper, valued at $11,529,367. No. 4, or Interior division, had a gold output of $1,035,339.

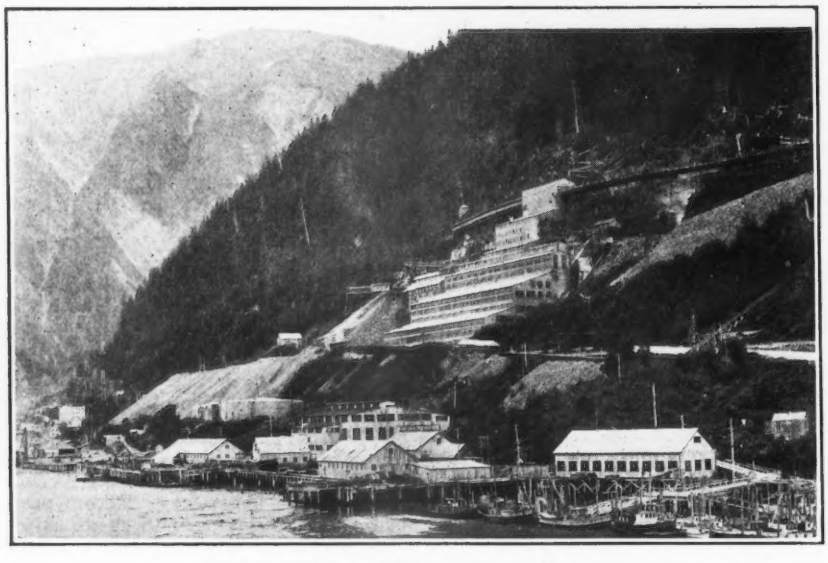
The Sea Level mine, at Ketchikan, has been taken over by the Alaska Paper Mills Co. to utilize the pyrite deposits in the manufacture of sulphuric acid used in the pulp industry. Alaska Premier, which is controlled by S. Guggenheim, is being amalgamated with the Daly-Alaska and Hobo properties. The Riverside mine, at Hyder, is working steadily and shipping concentrates to Selby Smelter. The Kasaan Gold Mining Co., of which K. Walker, of Hoquiam, Wash., is president, is developing the Harris Creek mine, on Prince of Wales Island. The work is in charge of W. J. Elmendorff, of Seattle. A shipment of 26 tons from this mine averaged $24.60 per ton. The Cliff Mine at Valdez will be reopened about July 1.

A new placer camp is being opened at Teikhel, where the Fourth of July Creek Placer Mining Co., of Valdez, is arranging to install a hydraulic plant. In sinking the test pits $2,000 in gold was recovered.

The Associated Oil Co. has stopped drilling operations at Cold Bay. The Cache Creek Dredging Co., operating 50 miles west of Talkeetna, on the Alaska Railway, is said to have recovered gold to the value of $175,000 last season. Another company is shipping in a hydraulic plant to operate in the same locality. A California syndicate is shipping in plant and supplies to test dredging gravel in Mills Creek, in the Yentna district.

The Healy River Coal Corporation, which is operating mines on the Alaska Railway, is making an effort to supply 50 per cent of the entire coal consumption of Alaska Territory, opening agencies at the various centers along the coast. G. W. Metcalf succeeds Norman C. Stines as general manager of dredging and hydraulic gold mining operations at Fairbanks for the U. S. Smelting, Refining & Mining Co. The company's success with cold-water thawing of frozen ground extended dredging operations at Nome last season until November. Formerly, August marked the limit of a season's operations. Several new dredges will be constructed at Fairbanks, the first to be in operation by 1928. The McDougal Gold & Silver Mines, Inc., is arranging for development of its Gold Bullion mine, at Fairbanks, and the Cliff mine, at Hyder. Nome Creek Dredging Co., of Fairbanks, is arranging to place a 5-cu.ft. dredge on its holdings in the Beaver district, within nine miles of Circle. The depth to bedrock is 10 ft., and there is no frozen ground.

Alaskan prospectors "sitting in" on a card game, with rocks and minerals substituted for the cards



Alaska Juneau Mill, Juneau, Alaska

Mineralogy at Sight

Eighteen prospectors are enrolled for the Short Mining Course now conducted at the Alaska School of Mines, at Fairbanks, Alaska. Dean Ernest N. Patty has devised a card game to teach the sight determination of rocks and minerals. This has proven a successful innovation in which the prospectors take keen delight. The losing side buys a dinner for the winners.

Alaska Juneau in February

During February, 1926, Alaska Juneau mined and trammed 272,700 tons, yielding a total of $149,500, or 54.82c. per ton. Operating costs totaled $139,650, or 51.21c. per ton; operating profit, $9,850, or 3.61c. per ton. Other expenditures and charges totaled $34,900, leaving a deficit of $25,050 for the month.

Additions to milling plant are reported about 73 per cent completed and at Ebner property preliminary work is about 70 per cent completed.

Old Placers Reworked By Modern Equipment

George A. Parks, Governor of Alaska, who has been in Washington for the last two months, stopped over in Denver, Colo., on his way back to Alaska. Asked as to mining conditions in the territory, he said:

"Modern equipment and large companies back of it have taken over the old placer work, and are operating on a huge scale, with the extraction of gold down to a point where it was never dreamed of in the old days."

London Letter

By W. A. Doman
Special Correspondent

Renewed Interest in Mining on the Continent—Onverwacht Yields 424 Oz. Platinum

London, March 16—It would appear that mining on the Continent of Europe is reviving. Little has been heard concerning it for some time, but two recent items of information are interesting. It is reported that the Rumanian Government has begun negotiations with an English syndicate for the reorganization of the Rumanian gold mines as a commercial undertaking. The state would take a share by providing 80,000,000 lei of capital in the new company, which would proceed to more intensive exploitation of the mines.

It is further reported that an Anglo-American group, including Brown Bros. and the International Acceptance Corporation, has, according to reports from Germany, granted a credit of 9,000,000 marks to the Mansfield Copper Co., and the suggestion is that this credit is the forerunner of a loan extending for a longer term.

Lead mining in the Peak district of Derbyshire, England, is receiving a certain amount of attention just now, owing to the proposals to nationalize royalties in coal mines and other minerals. Lead in the Peak district may be said to be nationalized already, for it belongs neither to the state nor to the owner of the soil, but to anyone who cares to dig for it. The owner of the soil, in fact, is at a disadvantage. It has been pointed out that, according to the customs prevailing in the Peak, if anyone thinks there is lead under a field all he has to do is to inform an official that he wishes to dig for it, and that he requires a sufficient amount of the surface to enable him to do so. A certain area is staked out, and the owner whose ground is disturbed receives no compensation whatever. The price of lead being low, there is no demand for mining ground in the Peak at present, but the position may change. Disappointment is expressed that the price does not improve, as it was expected to do with the Barrier mines, of Australia, working only half time, owing to drought.

The Transvaal Consolidated Land & Exploration Co. announces the February output of the Onverwacht reduction plant. It milled 654 tons, and the crude platinum produced is estimated to contain 424 oz. of platinum and allied metals. The current percentage of extraction is about 75. Although in some quarters the result was regarded as satisfactory, the market did not take kindly to it and lowered the price of the T. C. L. shares, which it says are still too high. The view is based on the fact that working costs are not stated and that the company has only a 65 per cent interest in Onverwacht. Generally speaking, people are now beginning to see that prices of shares in platinum companies were rushed up too high during the short-lived boom. Good results can scarcely be looked for on the figures then reached.

E. Homersham, the engineer called in to examine the Central West Mine (Rand), has issued his report, and a summary has been cabled to London. The document does not altogether clear up the position, and although it is drafted in a hopeful strain, it cannot be said to be convincing. It foreshadows rather heavy capital expenditure, and does not estimate a recovery of more than 23s. or 24s. a ton. It states, what is obvious, that the real future of the South (the rich) reef as a profit earner depends on values opened up when the section west of the shaft is developed, and there are few south reef faces available for immediate development.

Quebec Mines Yield Greater Returns in 1925

THE value of the products of the mines of Quebec for the year 1925 reached a total of $22,497,792, compared with $18,952,896 in the previous year, an increase of $3,544,896, or 18.7 per cent, according to a preliminary statement of the Quebec Bureau of Mines, This is the highest on record with the exception of the abnormal year of 1920, when the value reached $28,392,939. The rate of growth in the industry is indicated by the fact that in 1914 the total was under twelve million dollars and in 1906 it was just over five million dollars.

Chrome Ore Shipments from Karachi, India

The records of the Karachi (India) customs house show that 28,070 long tons of chrome ore were exported in the calendar year 1925 from this port to foreign destinations, in comparison with 15,930 in 1924, as reported by the U. S. Department of Commerce. This ore is derived from mines in British Baluchistan controlled by a syndicate of British capitalists. The 1925 shipments were divided as follows: 2,880 tons to Belgium, 4,150 to France, 1,850 to Germany, 6,238 to Great Britain, 1,850 to Italy, 5,402 to the Netherlands, and 5,700 to Sweden.

Austria Produces More Iron and Steel in 1925

Austria produced 377,323 metric tons of pig iron, 463,578 tons of steel ingots, and 351,793 tons of rolling mill products in 1925, compared with the 1924 output of 266,639 tons of pig iron, 369,643 tons of steel ingots, and 293,525 tons of rolling-mill products, says the U. S. Department of Commerce. Austrian mills have been working at high production levels ever since the wage strike of last October. This rate of production has been tapering off since the first of the year, but a recovery is anticipated with the beginning of seasonal construction enterprises.

Johannesburg Letter

By John Watson
Special Correspondent

Platinum Prospecting Continues —Onverwacht Production to Be Refined by Mond Nickel

Johannesburg, Feb. 23.—Active prospecting is being carried out on four platinum properties south of the Olifants River, says the Pietersburg correspondent of *The Star*, and results are said to be very encouraging. Large quantities of machinery have passed through en route to the Northern Platinum Co.'s property.

In the House of Assembly at Capetown, on Feb. 17, the acting Minister of Mines said that thirty-two discoverers' awards had been granted by the government in connection with platinum. In terms of the Precious and Base Metals Act, proclamation must await the selection and grant of owners' reservations, and arrangements in connection therewith were proceeding as fast as possible. Before deciding as to whether the portions falling to the crown for disposal shall be thrown open to pegging, or be disposed of by any other method, the government was anxious to obtain further information regarding the nature of the platinum occurrences and the prospects of the industry as a whole, with the view to deciding on the best method of disposing of the state's rights.

The Petroleum Corporation of South-West Africa, Ltd., has made plans to bore for oil, on a site selected by Dr. L. Reinecke, about 48 miles to the northwest of Keetmanshoop. The drilling contract has been let and the machinery is on the way to the property.

The annual meeting of the Ferreira Deep, Ltd., was held on Feb. 19. The chairman, F. Raleigh, said the mine was likely to carry on only restricted operations for eighteen months from the present time. In its twenty-five years, this property has produced a total value of £17,651,342, of which nearly £10,000,000 has been absorbed in working expenses and over £6,600,000 distributed in dividends.

The Central Mining Corporation has contracted with the Mond Nickel Company, Ltd., to have the entire production of the Onverwacht platinum property refined at the Mond precious-metals refinery in London.

The annual meeting of the Association of Mine Managers of the Transvaal was held on Feb. 19 in the Chamber of Mines council chamber. Arthur French, vice-president of the Chamber, was present and paid a tribute to the increased efficiency attanied in the economical working of the gold mines during the last two or three years.

A growing shortage of winding engine drivers (hoisting engineers) is said to be due to the fact that too few are being trained to make up for the industrial losses and contingencies. C. B. Brodigan was elected president, M. O. Tillard vice-president, and, as members of council, H. Mitchell, A. A. Coaton, C. L. Butlin, E. Parn and A. H. Krynauw were elected.

Societies, Addresses, and Reports

Mining and Geological Institute of India Meets at Calcutta

Special Correspondence

At the annual meeting and dinner of the Mining and Geological Institute of India held recently at Calcutta, Sir Henry Wheeler, the Governor of Bihar and Orissa, the principal guest, stated with pride that Bihar was in the front rank in mineral wealth, producing 70 per cent of the all-India output of coal, 95 per cent of its iron, and 93 per cent of its mica. There are besides large deposits of limestone, dolomite, manganese and copper.

A. C. Wentworth Lewis, proposing the toast to the "Mineral industries of India," pointed out that India was one of the pioneer countries to institute a Geological Survey Department, and referred to the enormous growth in recent years of the petroleum industry in Burma, which now stood first among the mineral industries of India. Incidentally, he dwelt upon the growth of the tin-plate industry in India, which has had its connection with the petroleum trade. The industry has had to struggle with material disadvantages, especially in the beginning, because Indian labor was less skilled, European labor was more expensive, and the Indian climate was another disadvantage. Operations started in 1922, and in 1923 about 10,000 tons of tin plates were manufactured; last year the production reached about 30,000 tons, and in the current year (1926) it is estimated that production would reach 3,000 tons a month.

E. H. Robertson, the newly elected president of the Institute, spoke on mining education, and expressed his deliberate opinion that there was more to be learned on a group of up-to-date collieries in England than in all the coal fields of India.

The report of the Institute shows its affairs to be in a flourishing condition. There are about 400 members. The Institute's gold medal was won by C. J. Fox for a paper on "Raw Materials for Iron and Steel Industry of India."

International First-Aid Contest Goes to San Francisco

The Fifth International First-Aid and Mine-Rescue Contest will be held at San Francisco, Cal., during the first week of September, 1926, under the auspices of the U. S. Bureau of Mines. The date and place of the contest, which is open to all miners, quarrymen, and workers in metallurgical plants and the petroleum and natural gas industries, has been approved by the Secretary of Commerce, following an invitation received from the Society of Safety Engineers of California. San Francisco has expressed its interest in the event by donating the use of the Civic Auditorium for the First-Aid Contest. The University of California has made available the use of the Greek Theatre for the mine-rescue contest.

Research Fellowships at Mining Schools

Opportunities are afforded to students who desire a period of active training in research work in mining and metallurgy through a series of cooperative agreements effected between the U. S. Bureau of Mines and various universities and colleges, according to the following statement issued by the Bureau of Mines:

"For the college year 1926-1927 more than thirty fellowships in eight institutions will be awarded. The problems to be studied cover a wide range of scientific research. Many students who have received these fellowships in past years have, as a result, obtained remunerative positions in the industrial field. Detailed information in regard to the terms of the different fellowships can be obtained by applying to the authorities in charge of the educational institutions named below, showing the number of fellowships and the annual value:

	Number	Value
School of Mines, Tuscaloosa, Ala.	5	$540
Carnegie Institute of Technology, Pittsburgh, Pa.	8	750
College of Mines, Seattle, Wash.	5	720
College of Mines, Tucson, Ariz.	2	660
University of Utah, Salt Lake City		720
School of Mines, Moscow, Idaho		600
School of Mines, Rolla, Mo.	4	800
Mackay School of Mines, Reno, Nev.	1	750

The purpose of this work is to undertake the solution of definite problems confronting the mining, metallurgical, and chemical industries of the various states.

Society of Economic Geologists Plans Madrid Meeting

An informal meeting of the Society of Economic Geologists has been arranged in connection with the International Geological Congress to be held in Madrid next May. The meeting will be devoted to discussions of society affairs, and will be combined with a lunch or dinner, affording an opportunity for the members to meet one another personally. To facilitate the preparation of this meeting, and to be sure that every member who goes to Madrid will be informed when and where it will take place, and as to other details of interest, members are requested to leave at the registration bureau of the International Geological Congress a note addressel to Per Geijer, Chairman, Geological Survey, Djursholm, Sweden, stating whether they wished to attend the proposed meeting; whether they desire to bring up any subjects for discussion or have other suggestions regarding the meeting, and also giving their Madrid address. The members of the committee in charge besides Per Geijer are Alan M. Bateman, H. A. Brouwer, and George H. Garrey.

Michigan Copper Conference Deferred Till June

The Michigan College of Mines committee in charge of the copper conference scheduled to be held at Houghton announces that the meeting will take place after May 1, instead of in April. This will permit several prominent metallurgists ample time to make arrangements to attend. The college office has received acceptances to invitations extended to Dorsey A. Lyon and Oliver C. Ralston, metallurgists of note with the U. S. Bureau of Mines. Mr. Lyon is chief metallurgist for the Bureau and Mr. Ralston is assistant chief metallurgist, at Berkeley, Calif. The Bureau of Mines is interested in the project, and all feasible equipment and technical data on hand will be at the disposal of the College of Mines and the conference committee.

In the opinion of copper-mining men, the proposed conference and program of research will have an important bearing on the future of the industry in Michigan. Each individual producer has its own problems to solve, such as the working out of methods and devices which will best suit its needs in drilling, rock handling, transportation, hoisting, pumping, and administration, but there are a number of problems common to all. These include recovery of copper from amygdaloid sands, which contain 5 lb. or more per ton; a larger extraction of silver; elimination of arsenic; and profitable methods of mining and treatment of low-grade copper rock. It is these larger problems, and those associated with prospecting, economics, and fabrication, which will receive major attention.

Tells Montana Engineers of "Try-Out" Course in College

Arthur F. Linforth, assistant chief geologist of the Anaconda Copper Mining Co., presided at the March meeting of the Montana Society of Engineers, held in Butte and known as "Bozeman College" night, in that three of the faculty of the Montana State College, of Bozeman, addressed the gathering. Earle B. Norris gave a discourse on "Trends in Engineering Education," in which he said, "Out of every hundred who enroll for the engineering course in the colleges of the country, only forty graduate. To protect the other sixty from the stigma of failure a new plan is being proposed—that of a two-year 'try-out' course, to be followed for those who demonstrate the 'engineering mind' by a regular two-year professional engineering course."

Imer Pett Heads Utah A.M.C.

Directors of the Utah chapter of the American Mining Congress at a recent meeting in Salt Lake elected Imer Pett, governor of the chapter; G. W. Lambourne, first vice-governor; D. D. Muir, Jr., second vice-governor, and H. M. Hartman, third vice-governor. A. G. Mackenzie was re-elected secretary-treasurer. H. M. Hartman, C. E. Loose, J. O. Elton, W. Mont Ferry, W. J. O'Connor, D. D. Moffat, and J. W. Wade were elected directors.

Men You Should Know About

Robert Marsh has returned to San Francisco from South America.

D. C. Jackling is on his way to New York and is visiting, en route, properties under his charge.

P. V. Roundy, of the U. S. Geological Survey, attended the Osage oil-lease sale on March 17 and 18.

Leslie Urquhart, chairman of the board of directors of the Russo-Asiatic Consolidated, Ltd., which company holds the largest individual claim against the Russian Soviet Government, is in New York with a party of British Engineers. Mr. Urquhart and his associates are en route for South America, where they will inspect many mining properties. **H. H. Knox**, former president of the Mining and Metallurgical Society of America, also arrived on the "Aquitania," with Mr. Urquhart and his party.

Times World Wide Photos

Leslie Urquhart, Mrs. Urquhart and H. H. Knox, aboard the "Aquitania"

Dr. Kuno B. Heberlein, of the National Process & Engineering Corporation, 42 Broadway, New York City, has returned from Europe.

Howard A. Poillon, of Poillon & Poirier, consulting mining engineers, 42 Broadway, New York City, returned to New York on March 28 from Nevada.

Dr. W. O. Hotchkiss, formerly State Geologist of Wisconsin, and now president of the Michigan School of Mines, is visiting the mining districts of Arizona.

Alfred James returned to London from New York on the "Olympic" on March 31 after an extensive tour in Arizona in company with **James Douglas.**

Mr. and Mrs. T. A. Rickard sailed on the "Patria" from New York on March 31 for Palermo and Sicily. They will attend the International Geological Congress at Madrid in May.

Leslie Bradford, manager of the Broken Hill Proprietary Co.'s iron and steel works at Newcastle, New South Wales, has been elected president of the Australasian Institute of Mining and Metallurgy.

H. S. Mulliken has established offices in the Colorado Building, Washington, D. C., for the private practice of his profession. While specializing in nonferrous metallurgy, he has, also, in representation at the Capital, various Western mining interests.

Hugh D. Miser, State Geologist of Tennessee, recently gave an illustrated address on "Erosion in the San Juan Canyon, Utah," at the University of Cincinnati. The lecture was attended by interested citizens and by faculty and students at the university.

Ralph W. Kerns, of the Engineering Department of the United States Metals Refining Co., left New York on March 29 for Santa Lucia, Cuba. He expects to remain there for about two months, during the erection of a pulverized-coal plant and crushing rolls installation at the Matahambre mines of the American Metal Co.

Orville B. Denison, national alumni secretary of the Massachusetts Institute of Technology, was the guest of honor at a complimentary dinner tendered to him by the Montana Society of M. I. T., consisting of former students, at the Thornton Hotel, in Butte, on March 13. **Charles W. Goodale**, who graduated from Tech in 1875, and who for many years was prominent in affairs of the Anaconda Copper Mining Co., was elected chairman of the Montana Society. **W. L. Creden**, consulting mining engineer, was elected Butte vce-chairman; **Albert E. Wiggin**, manager of the Great Falls smelter of the Anaconda company, was elected Great Falls vice-chairman, and **Carl J. Trauerman**, mining engineer, Butte, was elected secretary-treasurer.

Sir Robert N. Kotzé has been awarded the Gold Medal of the Institution of Mining and Metallurgy, of London, in recognition of his distinguished service to the mining industry, with special reference to his work on the dust problem in the mines of the Rand and of his public work in promoting the development of the natural resources of the Union of South Africa. "The Consolidated Gold Fields of South Africa, Ltd." Gold Medal goes to **Prof. L. H. Cooke**, A.R.S.M., in recognition of his services, extending over many years, in the advancement of the science and practice of mine surveying and the improvement of surveying instruments, and of his valuable contributions to the literature on the subject. "The Consolidated Gold Fields of South Africa, Ltd.," premium of forty guineas has been awarded to **Dr. H. C. Boydell** for his paper on "The Rôle of Colloidal Solutions in the Formation of Mineral Deposits." Sir Robert Kotzé occupies the position of Government Mining Engineer for the Union of South Africa.

Engineering and Mining Journal-Press has received the following:

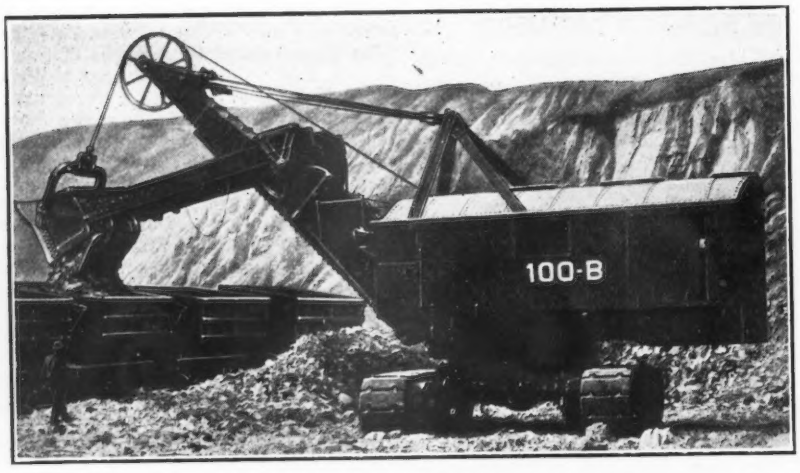
"On account of a possible misunderstanding of identity, due to a similarity of names and location, I beg to advise that Robert H. Dickson, manager of the Verde Central Mines, Inc., formerly superintendent of the '85 Mine, at Lordsburg, N. M., and before that chief engineer of the Calumet & Arizona Mining Co. at Bisbee and a contributor to the *Mining Journal* for the last fourteen years, is not Robert B. Dickson, who is the author of a considerably discussed paper "Americans vs. Mexicans in Arizona," published in the issue of Jan. 30, 1926. JACK RADCLIFFE."

Jerome, Ariz.,
March 18, 1926.

Obituary

Frederick W. Bacorn, well known in Montana as a financier and developer of mining properties, died in Butte, that state, on March 18. He was born in Chicago, in 1865, and received his primary education in the schools of that city, afterward receiving his degree from the University of Michigan, where he studied law. In 1885 he came to Montana to take a position at the Drum Lummon mine, near Marysville, and remained there until 1893, when he moved to Butte to practice law. After the panic of that period, he became interested in mining and was instrumental in financing and developing a number of properties. The great adventure of his life was the financing, developing, and, in conjunction with his brother, Harry C. Bacorn, a mining engineer, bringing to successful fruition the properties of the Jardine Mining Co., at Jardine, near the Gardiner entrance to Yellowstone Park. Formerly a producer of gold bullion only, the brothers Bacorn made of this property a producer of gold bullion, gold concentrates, arsenic, and tungsten. Always foremost in any enterprise launched for the benefit of Butte and Montana, Mr. Bacorn was twice nominated for district judge by the Republican Party. He was a member of the A.I.M.E., the Montana Society of Engineers, and the Silver Bow Club. Surviving him are his widow and two daughters.

New Machinery and Inventions



This intermediate-size shovel combines advantages of revolving excavator with the railroad-type machine

Another Intermediate Size Revolving Shovel

A 3-cu. yd. revolving shovel for general use has been developed by the Bucyrus Company, of South Milwaukee, Wis., recently. It is said to represent a new departure in that it is built along lines never before used in general-utility shovels. In design it follows the basic plan developed by the company in building the 120-B, a 4-cu. yd. mine and quarry full revolving shovel announced last year. In principle it offers a machine that combines the advantages of a small revolving shovel with those of the railroad-type shovel, but has a working range considerably greater than either. The makers claim that it has the speed of action, big dipper capacity, ruggedness, and power of the railroad-type shovel, with the mobility, the full revolving swing, and the maneuvering ability of the small revolving shovel. It is remarkedly close-coupled, the boom length being only 29 ft. 6 in. and the rear-end radius 16 ft. Throughout, the clearances have been held within close units so that the shovel is capable of working in close quarters and is suit ble for any sort of digging.

To Make Mining Equipment

The Canadian Locomotive Co., Ltd., of Kingston, Ont., is entering the field of manufacturing mine, mill and smelter equipment. It has recently completed arrangements to manufacture in Canada the entire line of the Colorado Iron Works of Denver, Colo.

Separate Unit for Manganese Steel Products

On March 1 last the newly incorporated Era Steel Co., Bucyrus, Ohio, took over the operation of the steel foundry of the Hadfield-Penfield Steel Co., of Bucyrus, as well as the sales of manganese and alloy steel products of that company.

New CO_2 Recorder Motor Driven

After considerable experimentation, a new motor-driven CO_2 recorder has been perfected and introduced on the market by the Republic Flow Meters Co., 2240 Diversey Parkway, Chicago, Ill. This recorder is shown in the cut.

Since it does not operate by water power, water conditions at the place of installation need no consideration whatever, it is claimed. The entire mechanism of the instrument is completely submerged in oil, this reducing wear to a minimum and eliminating corrosion, said to be the chief difficulty found in water-driven CO_2 recorders.

The case of the instrument is dirt-proof. It has been designed for appearance and easy vision as well as for accuracy and ruggedness. It is arranged so that it is easy to change both the oil and potash. All parts are interchangeable. A small motor is used to operate the instrument, and, though small, it is capable of handling a load of two or three times that required.

The operation of the recorder is as follows: When the gases are drawn through the furnace into the instrument they pass through a brass tubing immersed in oil. They then go through the pump and more brass tubing before passing to the measuring chamber. The gas in passing through the pump is divided into very fine particles and comes into close contact with the metal. This gives it the temperature of the pump and the surrounding oil. It then passes into the measuring chamber, which is immersed in the same oil and measured at a specific temperature. Next the gas passes through the potash chamber and then into the final measuring chamber, this last also being immersed in the same oil as in the first measuring chamber.

The oil chamber is directly above and in contact with the potash chamber, so that the oil and potash are the same temperature or nearly so. If there is a difference in the temperatures of the oil and the potash, corrections will be made in the final measuring chamber, which also is surrounded by the oil. Therefore, no error can be caused by temperature irregularities.

The instrument requires about two gallons of ordinary machine lubricating oil, which should be changed every six months or every year. The potash chamber holds about three gallons of potash, calling for 12 lb. of dry potash. This will last from four to six months at least.

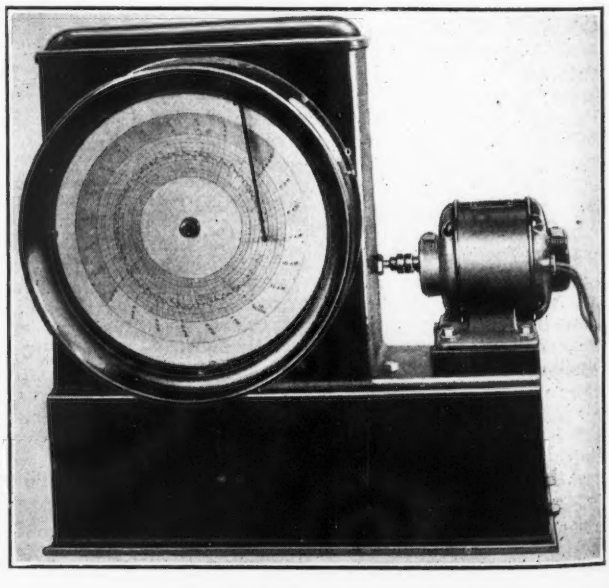
Trade Catalogs

Rolls—Traylor Engineering & Manufacturing Co., Allentown, Pa., describes its line of heavy-duty crushing rolls in Bulletin 1106, just issued.

Conduits — Bulletin 2085 of the Crouse-Hinds Co., Syracuse, N. Y., covers "condulets for grounding service wire and conduit system." Bulletin 2086 covers safety Arkite plugs and receptacles, interlocking switches and plugs, and safety hand lamps.

Grinder—Catalog 32 of Hisey-Wolf Machine Co., Cincinnati, Ohio, includes a description of a new double slide angle plate grinder.

Entire mechanism of this motor-driven CO_2 recorder is submerged in oil, reducing wear. The absence of water eliminates corrosion



The Market Report

Metal Markets Weather Wall Street Decline Fairly Well

Prices Generally Easier—Business in Lead and Zinc Dull, but Activity in Copper Up to Average

New York, March 31, 1926.—The persistent declines in the New York stock market naurally have been reflected in a generally pessimistic feeling among metal consumers. In spite of this, prices thus far have not been seriously affected. The volume of business with consumers of lead, zinc, and tin has been small, but copper buying has been by no means dull. Opinion is divided as to the amount of actual forward business on the books of manufacturers, but on the whole it seems that there is a recognizable shrinkage unless users of copper happen to be the exception. The lack of support of the stock market by the "banking interests" leads some to the belief that they see elements in the situation that do not appear on the surface. Hesitancy on the part of buyers is a result.

Daily Prices of Metals

Mar.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
25	13 75	62 875	64 125	8.20	8.00@8.05	7.10@7.15
26	13.70	63 00	64 125	8 20	8.00@8.05	7 15
27	13.70	63.00	64 00	8 225	8.00@8 05	7.125
29	13.725	63 00	64.00	8.225	8.00	7.125
30	13.725	62 00	63 00	8 20	8.00	7 10
31	13.65	62.25	63.25	8 20	8.00	7 10@7.15
Av.	13.708	62.688	63.750	8.208	8.013	7 125

*The prices correspond to the following quotations for copper delivered: March 25th, 14.00c.; 26th and 27th, 13.95c.; 29th and 30th, 13.975c.; and 31st, 13.90c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Mar.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
25	58 1/8	59 1/8	64 3/4	287	279 1/2	30 7/8	31 1/4	33 1/8	33 3/8
26	57 7/8	58 1/4	64 1/2	288 1/2	280 1/2	30 5/8	31	33 3/8	33 5/8
29	57 3/4	58 5/8	64 3/4	287 3/4	280 1/2	30 5/16	30 3/4	33 1/4	33 7/16
30	57 1/8	58	64 1/4	282	275 7/8	30 5/16	30 3/4	33 5/16	33 3/8
31	57 3/8	58 3/8	64 1/4	284 1/2	276 1/2	30 1/4	30 11/16	33 1/4	33 3/8

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Mar.	Sterling Exchange "Checks"	Silver		Gold London	Mar.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
25	4 85 3/4	65 5/8	30 3/16	84s11 1/2d	29	4.85 3/4	65 3/4	30 1/2	84s11 1/2d
26	4 85 3/4	65 5/8	30 3/16	84s10 3/4d	30	4 85 3/4	65 1/2	30 3/16	84s11d
27	4.85 3/4	65 5/8	30 1/4	....	31	4 85 3/4	65 3/8	30 1/8	84s10d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Average Metal Prices for March, 1926

Copper:	
New York Electrolytic	13.859
London Standard spot	58.603
London Electrolytic Spot	65.489
Lead:	
New York	8.386
St. Louis	8.165
London Spot	31.625
London Forward	31.921
Silver:	
New York	65.880
London	30.299
Sterling exchange	485.606
Zinc:	
St. Louis	7.332
London Spot	34.090
London Forward	34.247
Tin:	
99 per cent	63.472
Straits	64.505
London	292.288
Quicksilver	88.194
Antimony	19.708
Refined	112.000
Platinum:	
Crude	106.278
Aluminum, 98 per cent	27.000

Copper Breaks Through 14c.

Some copper has been sold each day since last Wednesday at 13.875c. delivered, but in volume it is considerably less than that which has been sold at 14c. for delivery in Connecticut and at other destinations in the East. Two sellers who had March and April copper that they desired to place disposed of what they had available and now are asking 14c. None of the producers has an accumulation of unsold metal above normal current stocks, and those "in the know" look for a sizable decline in the combined stocks of blister and refined for the month of March. The business done during the last week has been mostly for April delivery, with some for May but practically none for postions further ahead. The European market has continued dull. Metal has been sold at 13.65c. and 13.75c. f.a.s. for prompt and near-by delivery.

Lead Slightly Weaker

No change has been made in the official contract price for lead as quoted by the American Smelting & Refining Co., which continues at 8.20c., New York, but there is an easier tendency to the market owing to continued declines abroad and the marked depres-

sion of stock prices in Wall Street. Some small carload lots of lead for prompt shipment, or lead from Middle Western producers, has sold in the East at 8.30@8.35c., New York basis, during the week, but there is less of this business now than a week ago. On the other hand, holders of April and May lead have canvassed the market pretty thoroughly in an effort to sell at any point in New York or Connecticut at 8.20c., without much success though one good lot was sold yesterday. It is, of course, much more profitable to sell Mexican ore lead in this country than to ship it abroad, if 8.20c. or even slightly less can be obtained.

In the Middle West, the leading producers of chemical lead have been realizing either 8 or 8.05c. on most of the sales that they have made. The volume of business is distinctly less than last week, and consumers are not interested in buying far ahead. Some resale offerings have been made at 7.95c., it is reported.

Lead consumption continues about as heavy as ever, and many buyers are specifying the limit on contracts. This fact, together with exceedingly limited stocks, and an apparently somewhat curtailed world production, would make for strength in the domestic market were it not for the fact that sentiment is influenced by weaker tendencies in some of the other metals and by the lower quotations that are reported so regularly from London.

Corroding grades of lead are selling at the customary premium of 10 to 15 points over common desilverized.

Narrow Fluctuation in Zinc Price

With producers not pressing the metal for sale, zinc prices have ruled very steady during the week, between 7.10c. and 7.15c. per lb. at St. Louis. An upward tilt to the market is noted today, though the reason assigned for this is buying by dealers and second hands rather than by consumers. The London market likewise has remained steady, prices today being practically the same as those of a week ago. High grade is now obtainable at 8¾c. per lb. in New York, and a premium on Brass Special of as much as 12½ points has been realized.

Tin Declines to 63c.

Consumers have shown little interest in the tin market during the last week, and prices declined somewhat, reaching 63c. for prompt Straits yesterday, though there was a little improvement today. Most of the buying has been on the part of dealers who anticipate a particularly tight market for early deliveries during the next month or two. The prices asked for spot are largely nominal and subject to negotiation. June tin has sold for about 2c. per lb. less than prompt.

New York Silver Down to 65⅜c.

Continued weakness in China exchanges with consequent sales from that quarter have further depressed silver to the extent that London receded again to 30⅛d., and New York established a new low for the year on March 31, 65⅜c. Market conditions are quiet, and with the Easter holidays in prospect a further decline is possible.

Mexican Dollars: March 25th, 26th, and 27th, 50⅜c.; 29th, 50¼c.; 30th, 50¼c.; 31st, 50⅛c.

Francs Continue Weak

"Francs at New Low" continues to be the most common headline used in describing exchange operations. Closing cable quotations on Tuesday, March 30, were as follows: francs, 3.425c.; lire, 4.02 1/16c.; and marks, 23.81c. Canadian dollars, 1/16 per cent discount.

Zinc Blende $2 Lower—Lead Ore Unchanged

Joplin, Mo., March 27, 1926

Zinc Blende	Per Ton
High	$54.25
Premium blende, basis 60 per cent zinc	$48.00@$49.00
Prime Western, basis 60 per cent zinc	$47.00
Fines and slimes, 60 per cent zinc	$46.00@$42.00
Average settling price, all zinc	$47.88
Galena	
High	$110.00
Basis 80 per cent lead	$100.00
Average settling price, all lead	$105.55

Shipments for the week: Blende, 18,234; lead, 2,184 tons. Value, all ores the week, $1,103,680.

Shipments for three months: Blende, 224,137; calamine, 120; lead, 33,079 tons. Value, all ores three months, $15,706,840.

Sellers were slow in accepting offerings at the lower prices, and only 12,190 tons of the 18,500 tons produced were sold. Demand for ore for export the last three weeks has induced some producers to swell their output, while others are following a policy of restriction, owing to the weaker domestic demand. The bulk of ore reported sold tonight was produced by subsidiaries of the various smelting companies, and represents only a transfer of stocks. The Associated Metals Co., of New York, has purchased heavily the last three weeks, for export, in addition to two local buyers who purchase steadily for export.

Lead ore continues steady, the majority of sellers accepting current offerings though a few are holding for April or May developments.

Platteville, Wis., March 27, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$49.00
Lead Ore	
Lead, basis 80 per cent lead	$100.00

Shipments for the week: Blende, 1,116 tons; lead, none. Shipments for the year: Blende, 12,320; lead, 362 tons. Shipments for the week to separating plants, 2,014 tons blende.

Steel Steady—Pig Iron and Coke Dull

Pittsburgh, March 30, 1926

Pig-iron production in 1925, as officially reported, was 36,700,566 gross tons, or 9 per cent under the record made in 1923. Production of steel ingots, on the other hand, made a new record by a small margin. Demand for foundry grades of pig iron has not increased in recent years as has demand for steel.

The automobile industry has probably now reached the height of its operation. Agricultural implement factories are running very well.

Pig Iron—The market continues very dull, with a remarkable absence of second-quarter buying. Many consumers have not fully specified first-quarter contracts. Prices are maintained, at $21 for bessemer, $20 for basic and $20.50 for foundry, f.o.b. Valley furnaces, but buyers doubt whether these figures will hold.

Connellsville Coke—The market has been dull, with second-quarter contracting out of the way. Spot furnace is a trifle easier, at $3@$3.25, spot foundry remaining steady at $4.50@$5.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified.

Aluminum—99 per cent, 28c. per lb.; 98 per cent, 27c. London, 98 per cent, £118 long ton. Domestic demand good. Fair business in Great Britain. Norwegian production well maintained.

Antimony — Per pound, New York, duty paid: Chinese brands, spot, 20½@19c.; May arrival, 19@18c. Cookson's "C" grade, spot, 23c. Market entirely nominal. Little activity has been shown in this market since the first of the year.

Chinese needle, lump, 15@16c. Standard powdered needle, 200 mesh, 19½@20c. White oxide, Chinese, 99 per cent Sb_2O_3, 18@19c. Nominal; little business.

Bismuth—$2.70@$2.75 per lb. in ton lots. London, 10s.

Cadmium—60c. per lb. London, 2s. 2d. for American metal; 1s. 9d. for Australian metal.

Cobalt—Shot, 96@98 per cent, $2.50 per lb. Black oxide, 70 per cent, $2.10; gray oxide, 75 per cent, $2.25. London, 10s. for metal; 8s. for black oxide; 8s. 10d. for gray. Market quieter. Union Minière production may be larger than expected, and prices may be affected adversely.

[1]Germanium Oxide—25 to 50 gm. lots, $6 per gm.

Iridium—$225@$235 per oz. for 98@99 per cent. Nominal. London, £70@£75 for 99.5 per cent.

[1]Lithium—95@96 per cent grade in 1 to 5 lb. lots, $65 per lb.

Magnesium—Ingot, 75@80c. per lb. in ton lots, depending on quality; best 99.85 per cent. Used as deoxidizer for nickel, nickel alloys, bronze and special non-ferrous alloys including aluminum. Demand gradually increasing.

London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]Molybdenum—99 per cent, $25 per kg.; C. P. metal, $80 per kg.

Monel Metal — Base price for shot, 32c. per lb.

Nickel—Ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade). Market good during March. London, £170@£175 per long ton, according to quantity.

Osmium—$85@$90 per oz.; London, £19@£22.

Palladium—$78@$82 per oz. Crude, $60@$65 per oz. London, £14@£16¼, nominal.

Platinum — Refined, $112 per oz. officially quoted. Sales also at $106@$109. Crude, $105@$107. The market is rather demoralized on account of reports of new fields and the possibility of large production.

London, £22½@£23½ per oz. for refined, and £21@£22 for crude. Demand limited.

Quicksilver—Per 75-lb. flask, $87.50 @$88.50. London, £15. San Francisco wires $89. Market is steady.

Radium—$70 per mg. radium content.

Rhodium—$80@$95 per oz.; London, £14@£17. Nominal.

Ruthenium—$75@$85 per oz.; London, £13@£16.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $1.95 per lb. in ton lots.

Tellurium—$2 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $8 per lb. in 25-lb. lots.

Tungsten Powder—97 to 98 per cent pure, $1.18@$1.20 per pound.

[1]**Zirconium Metal**—98 per cent grade, per lb., $30, in 5 to 10 lb. lots.

Metallic Ores

Chrome Ore—Rhodesian, Indian, New Caledonian, 50-54 per cent Cr_2O_3 $22@ $23, c.i.f. Atlantic seaports; nominal.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

High-phosphorus foundry, over 0.18 per cent P, $4.15.

Base prices are the same as those that prevailed last year, having been established by early settlements made during the current season.

Eastern ores, cents per unit delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10½c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 11@11½c.

Spanish and Algerian, low-phosphorus, 52@54 per cent, 9½@10c.

Spanish foundry or basic, 50@54 per cent, 8½@9½c.

Swedish foundry or basic, 66@68 per cent, 9½@10c.

Foreign ores, particularly Spanish, are a little firmer.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports: Brazilian, 42c., nominal; Indian, 42c., nominal; Caucasian (unwashed), 40c.; Caucasian (washed), 42c.; market has been continually dull.

[1]Chemical grades, powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—55@60c. per lb. of MoS_2 for 85 per cent MoS_2 concentrates, f.o.b. mines. Largely nominal.

Tantalum Ore—Foreign, 50@75c. per lb. of Ta_2O_5 contained, c.i.f. New York.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $11.75@$12; Western scheelite, $12.25@$12.75. Domestic demand very light, and prices largely nominal but firmly maintained. European demand fair. Curtailment in supplies from China anticipated.

Vanadium Ore—Containing 4½ per cent V_2O_5 recently has sold at 25@35c. per pound of V_2O_5, f.o.b. Montrose, Colo.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can serve only as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can be ascertained only by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Andalusite—Sorted, $45@$50 per ton, f.o.b. *South Dakota* mines. Sales mostly for experimental lots.

Asbestos—F.o.b. *Quebec* mines, tax and bags included, per ton:

Crude No. 1, $525; crude No. 2, $300; spinning fibers, $190; magnesia and compressed sheet fibers, $125@$150; shingle stock, $70; paper stock, $40@ $45; cement stock, $25; short fibers, $10@$17.50; floats, $15.

The market is good and prices are firm, being official prices quoted by the new consolidated company. Two producers who use their own output have agreed to turn any surplus over to sales agents of merger; two large producers have no agreements with merger.

No. 1 Rhodesian crude, $325; No. 2, $250 per ton, c.i.f. New York. Market excellent, with principal producer well sold ahead.

Barytes—F.o.b. mines, per ton, bags extra:

South Carolina: Crude, $7@$8 per gross ton; ground, off color, $14@$17 per short ton.

North Carolina: White bleached, $22 per short ton; white natural, $20.

Georgia: Barytes ore, washed, $7.50. Demand moderate.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works. Crude ore, $8@$8.25, f.o.b. mines.

Canada: 94@96 per cent $BaSO_4$, $9 per net ton, f.o.b. mine.

Bauxite — American, f.o.b. shipping point per gross ton: Crushed and dried, $5.50@$8.50; pulverized and dried, $14; calcined, crushed, $17@$20.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2, $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

Prices are largely nominal, as contracts cover most of the 1926 deliveries.

Borax—Carload lots, in bags, per lb.: crystals, 5c.; granulated or powdered, 4¾c.; f.o.b. plant, *Illinois*.

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $30 per ton in carload lots.

Chalk—Crude, in bulk, per ton c.i.f. New York, $4.75@$5.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton: crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$20; ground, $7@$10.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Georgia, washed lump, $8.65; *Florida*, washed lump. $13. Market slow.

1A grades, domestic, $16@$17, f.o.b. *Delaware* plants. Market fair.

Imported English, f.o.b. American ports: Pottery, white ware, $18.50@ $21; paper clay, $17.50.

Diatomite—Per short ton, f.o.b. plant, *California:*

Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40. "Calatom" (mill run), $14@$16.50 depending on quantity; market quiet.

Emery — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb.: Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½c. Market good.

Feldspar — F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $6@$6.50 per long ton, depending upon quality. Market good.

New Hampshire: No. 1, not over 10 per cent SiO_2, $8.50 per short ton; pottery grade, $7.50. Ground, $17. Market normal.

New York: Per ton, f.o.b. cars, No. 1 crude, $9. Market good.

Maine: No. 1, ground, $19 per ton. Good demand.

Tennessee: No. 1 pottery, $16@$18 per ton for 140 and 200 mesh respectively. No. 1 enamel, 140 mesh, $14; 200 mesh, $16. Competition keen with some cutting of prices to get business, but demand good.

Maryland: 140 mesh, $18@$22; 120 mesh, $16; 60 to 100 mesh, $12@$15.

Canada, f.o.b. mine: High potash, $9 per ton, f.o.b. Quebec; crude, No. 1, over 12½ per cent potash, less than 5 per cent free SiO_2, $7.75@$8.50; crude, No. 2, 20 to 25 per cent free SiO_2, $6.25@$6.50.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per short ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $18. Foundry lump, 85-5, $20. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50. Acid lump, 98-1, $30 in car lots. Acid ground packed in bags, $40@$45. Fair tonnage sold; price of gravel spar firmer. Strong competition.

Canada: 84@86 per cent CaF_2, less than 5 per cent silica, $16.

New Mexico: 85-5 gravel, $15.75; 80-6 gravel, $15 f.o.b. mines. Ground, 96 per cent through 100 mesh, $35. Market stronger.

Fuller's Earth—Per ton, f.o.b. *Midway, Fla.:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh "up," $8; 200 mesh "up," $15. Market somewhat stronger.

Powdered, imported, duty paid, $23@ $25 per ton.

Garnet—Per ton f.o.b. mines:

Domestic, $85; *Canadian*, $70@$80.

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

Jet asphaltum, $36; selects, $33; seconds (ordinary grades), $25.50; peerless black, $32.90. Market steady.

Graphite—F.o.b. New York, per lb.: Ceylon lump, 9@10c.; chip, 7½@8½c. dust, 3@6c. Madagascar flake, 7½@9c. Market quiet, but prices for imported product marked up.

Flake, 10@20c. according to grade; fine ground crystalline, 7@10c.; amorphous ground graphite, 6@8c. Crude amorphous graphite, $15@$35 per ton according to grade.

Prices firm; market steady and fairly strong.

Greensand—Per ton, f.o.b. cars, *New Jersey:* screened and bagged, best grade in carload lots, $30. Good spring business has developed.

Gypsum—Per ton f.o.b. mill, depending upon location: Crushed, $2.50@$3; ground, $4@$6; agricultural, $6@$12; calcined, $7@$13.

[1]**Ilmenite**—Concentrates, 52 per cent TiO_2, 1½c. per lb., f.o.b. *Virginia* points. $60 per short ton, *Florida* mines.

Iron Oxide (See Ocher)—Standard Spanish red, 3@4c. per lb.; domestic earth, 2@4½c.

Kaolin—See China Clay.

[1]**Lepidolite**—$20@$30 per ton for ordinary grades. Nominal.

Limestone—F.o.b. shipping points, depending on location: crushed, ½ in. and less, 90c.@$2; 3 in. and larger, 90c. @$1.80 per ton.

Agricultural, $1.50@$5 for pulverized; 75c.@$2 for crushed, depending upon source, purity, and fineness.

Magnesite—Per short ton, f.o.b. *California* mines: Grade "A" calcined, 80 per cent through 200 mesh, $38@$42; dead burned, $35; crude, $14. Market fair, but improvement expected with spring building season.

Manjak—Barbados, in 10-ton lots, c.i.f. New York: grade "A," 6c. per lb.; grade "AA," fine, 8½c.

Mica—F.o.b. plant, per ton:

North Carolina: 20 mesh, roofing, $38; 100 mesh, white ground, $70. Market good.

New Hampshire: Mine run, $380, clean shop scrap, $25; mine scrap, $20. White, dry ground, 20 mesh, $35; 40 mesh, $45; 60 mesh, $60; 100 mesh, $75; 200 mesh, $85. Market good.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: special grade, $3@$3.25; No. A 1, $2.75; No. 1, $2.50; No. 2, $2.20; No. 3, $1.20; No. 4, 60@70c. No. 5, 42@45c. Grades depend on size of sheets.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher—F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $25@$28; second grade, 99 per cent through 225 mesh, $19. Market good.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $7; 75 per cent, $6.25; 74@75 per cent, $6; 70 per cent, $4.50; 68 per cent, $4.10. Market firm with good demand for the lower grades. Prices are up from 60c. to 75c. from a month ago.

Florida, pebble, domestic: 76@77 per cent, $6; 75 per cent, $5; 74@75 per cent, $4.75; 70 per cent, $3.50; 76@78 per cent special, $6.50. Market better, with higher prices for most grades.

Tennessee, lump, 3-in. screen, base 75 per cent, $6. Ground, 95 per cent through 200 mesh, base 65 per cent, $7.25; 70 per cent, $8.25. Market slow at the moment.

Potash—	Bags	Bulk
Muriate of potash 80@85 per cent, basis 80 per cent	$34.90	$33.65
Sulphate of potash 90@95 per cent, basis 90 per cent	45.85	44.60
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	26.35	25.10
Manure salt 30 per cent	20.00	18.00
Manure salt 20 per cent	13.35	11.35
Kainit 14@16 per cent	10.50	8.50
Kainit 12.4 per cent	10.00	8.00

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons. Prices guaranteed against sellers' decline until April 30, 1926. Strong undertone to market.

Pumice Stone—In barrels, per lb., powdered, 3@5c.; selected lumps, 6@8c.; lumps in bags, 4@6c.

Pyrites—Tharsis, per long ton unit of sulphur, c.i.f. U. S. ports: furnace size, 13½c. Cinder from ore to remain property of buyers. Market firm, with good inquiry.

[1]**Quartz Rock Crystals**—Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices.

Rutile—*Virginia*, per lb.; granular, 94@96 per cent TiO_2, 12@15c.; pulverized, 100 mesh, 94@96 per cent, 17@30c.

Florida 93 per cent TiO_2, $200 per ton.

Silica—Water ground and floated, per ton in bags f.o.b. *Illinois:* 450 mesh, $31; 350 mesh, $26; 250 mesh, $20.

Glass sand, f.o.b. producing plant, $1.25@$5 per ton; brick and molding sand, 40c.@$2; blast sand, $2@$4.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$18 per ton for domestic, f.o.b. *Texas* mines; $22 for export, f.a.s. Atlantic ports. Good shipment against contracts. Open prices $1 higher. Prices up $2 from a month ago.

Talc—Per ton, carload lots, f.o.b. works, containers included:

Vermont: 99 per cent through 200 mesh, extra white, $11@$12; 96 per cent through 200 mesh, medium white, $10@$11; packed in 50-lb. paper bags. Demand slack, but prices steady.

New York: Double air-floated, 100 mesh, $11.25; 200 mesh, $13.75; 325 mesh, $14.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, $10@$12; market fair; prices higher.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri*: Once ground through 40 mesh: rose and cream colored, $16. Double ground through 110 mesh: rose and cream, $17. Air-floated through 200 mesh: rose and cream, $25; mill run, $15. Active business at lower prices.

[1]**Zircon**—Freight allowed east of Mississippi River: 95 per cent, 3c. per lb., f.o.b. mines, in carload lots.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Mineral Products

Arsenious Oxide (white arsenic)—3@3½c. per lb. Several cars sold. London, £14@£15 per long ton.

Copper Sulphate—Large crystals, 4.45@4.75c. per lb.; small, 0.1c. less.

Sodium Nitrate—Spot, crude, $2.72@$2.75 per 100 lb., ex vessel Atlantic ports.

Sodium Sulphate—$1.10@$1.15 per 100 lb., f.o.b. works, for Glauber's salt.

Zinc Oxide—Per lb. in bags: Lead-free, 7½c.; 35 per cent leaded grades, 8c.; French, in car lots, 10½c.

Ferro-Alloys

[1]**Ferrocerium**—$7 per lb.

Ferrochrome—1@2 per cent carbon, 23@25c. per lb. of contained chromium; 4 to 6 per cent carbon, 10½@12c. per lb.; 0.1 per cent, 35c. per pound.

Ferromanganese—Domestic, 78@82 per cent, $90 per gross ton. British product held at $110, seaboard, duty paid. Spiegeleisen, 19@21 per cent, $33@$34 f.o.b. furnace; 16@19 per cent, $32.

Ferrophosphorus—Electrolytic, 18 per cent P, $91 per ton; 24 per cent, $122.50; f.o.b. Ala. and Tenn.

Ferrosilicon—14 to 16 per cent, $42 @$47 per gross ton, f.o.b. works; 50 per cent, $85 delivered in carload lots; 75 per cent, $145. Market active.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—$1.14@$1.17 per lb. of contained W, f.o.b. works, according to grade.

[1]**Ferro-uranium**—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works in 500-lb. lots.

Ferrovanadium—Per lb. of V contained, f.o.b. works, $3.25@$4, depending on grade and delivery.

Metal Products

Rolled Copper—Sheets, 22½c.; wire, 16½c.

Nickel Silver—29½c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Dimension sheets, 19½c. per lb.; rods, 16½c. per lb.

Zinc Sheets—12c. per lb., f.o.b. works.

Lead Sheets—Rolled, 11½c.; clipped, 12c.

Refractories

Chrome Brick—$45@$48 per net ton, f.o.b. shipping point.

Firebrick—First quality, $43@$46 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $35@$40.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick—$40 per M. Pennsylvania and Ohio; $48@$52 Alabama.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1925	1926	1925	1926	1925	1926
January	68.447	67.795	32.197	31.322	477.702	485.295
February	68.472	66.773	32.245	30.797	476.886	485.852
March	67.808	65.880	31.935	30.299	477.279	485.606
April	66.899	.....	31.372	.....	479.034	.....
May	67.580	.....	31.276	.....	484.960	.....
June	69.106	.....	31.863	.....	485.553	.....
July	69.442	.....	31.954	.....	485.514	.....
August	70.240	.....	32.268	.....	485.264	.....
September	71.570	.....	32.983	.....	484.270	.....
October	71.106	.....	32.972	.....	483.909	.....
November	69.223	.....	32.155	.....	484.201	.....
December	68.889	.....	31.835	.....	484.538	.....
Year	69.065	.....	32.088	.....	482.426	.....

New York quotations cents per ounce troy, 999 fine, foreign silver. London pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1925	1926	1925	1926	1925	1926
January	14.709	13.822	66.065	59.013	70.607	65.325
February	14.463	13.999	64.714	59.669	69.525	66.375
March	14.004	13.859	62.892	58.603	67.739	65.489
April	13.252	.....	60.575	.....	64.194	.....
May	13.347	.....	60.131	.....	63.560	.....
June	13.399	.....	59.899	.....	63.369	.....
July	13.946	.....	61.467	.....	65.750	.....
August	14.490	.....	61.613	.....	68.169	.....
September	14.376	.....	61.886	.....	67.693	.....
October	14.300	.....	61.977	.....	67.523	.....
November	14.353	.....	61.280	.....	67.893	.....
December	13.866	.....	59.540	.....	65.625	.....
Year	14.042	.....	61.920	.....	66.804	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London		
	1925	1926	1925	1926	1925	1926	1926 3 M
January	10.169	9.255	9.953	9.102	41.443	34.778	34.584
February	9.428	9.154	9.126	8.991	37.944	33.903	33.903
March	8.914	8.386	8.578	8.165	36.804	31.625	31.921
April	8.005	.....	7.662	.....	32.791	.....	.....
May	7.985	.....	7.780	.....	32.283	.....	.....
June	8.321	.....	8.024	.....	33.479	.....	.....
July	8.151	.....	8.054	.....	34.698	.....	.....
August	9.192	.....	9.284	.....	38.188	.....	.....
September	9.508	.....	9.303	.....	38.884	.....	.....
October	9.513	.....	9.299	.....	39.017	.....	.....
November	9.739	.....	9.578	.....	36.872	.....	.....
December	9.310	.....	9.157	.....	34.739	.....	.....
Year	9.020	.....	8.817	.....	36.429	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1925	1926	1925	1926	1925	1926
January	57.692	61.415	58.250	2.275	265.560	282.038
February	56.517	62.653	57.068	63.705	262.181	287.107
March	53.038	63.472	53.733	64.505	245.682	292.288
April	51.380	.....	52.135	.....	237.006	.....
May	53.675	.....	54.620	.....	245.476	.....
June	54.885	.....	55.957	.....	252.476	.....
July	56.683	.....	58.014	.....	258.435	.....
August	56.649	.....	58.190	.....	258.538	.....
September	56.405	.....	58.247	.....	259.182	.....
October	60.462	.....	62.274	.....	277.722	.....
November	62.136	.....	63.304	.....	284.506	.....
December	61.952	.....	62.928	.....	284.920	.....
Year	56.790	.....	57.893	.....	260.974	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London		
			1925		1926
	1925	1926	Spot	1926	3 M
January	7.738	8.304	37.917	38.059	37.363
February	7.480	7.759	36.528	36.053	35.956
March	7.319	7.332	35.741	34.090	34.247
April	6.985	.....	34.644	.....	.....
May	6.951	.....	34.223	.....	.....
June	6.990	.....	34.149	.....	.....
July	7.206	.....	34.894	.....	.....
August	7.576	.....	36.691	.....	.....
September	7.753	.....	37.435	.....	.....
October	8.282	.....	39.884	.....	.....
November	8.614	.....	39.039	.....	.....
December	8.565	.....	38.327	.....	.....
Year	7.622	.....	36.624	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)		
	New York		New York		Refined		Crude
					New York		
	1925	1926	1925	1926	1925	1926	1926
January	17.428	23.490	81.596	87.960	117.000	118.200	113.20
February	19.795	21.676	79.386	87.580	117.000	113.909	108.341
March	15.553	19.708	80.481	88.194	117.000	112.000	106.278
April	12.553	.....	82.327	.....	118.269	.....	.....
May	15.770	.....	81.360	.....	119.850	.....	.....
June	16.500	.....	83.154	.....	120.000	.....	.....
July	17.779	.....	83.077	.....	120.000	.....	.....
August	17.683	.....	82.317	.....	120.000	.....	.....
September	17.143	.....	81.730	.....	120.000	.....	.....
October	18.029	.....	83.856	.....	120.000	.....	.....
November	20.000	.....	88.250	.....	120.000	.....	.....
December	21.692	.....	90.000	.....	120.000	.....	.....
Year	17.494	.....	83.128	.....	119.093	.....	.....

(a) Antimony quotations in cents per pound for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1925	1926	1925	1926	1925	1926
January	24.66	22.76	23.76	21.76	23.76	22.26
February	24.50	22.76	23.26	21.76	23.76	22.26
March	24.06	.....	23.06	.....	22.91	.....
April	22.89	.....	21.76	.....	22.26	.....
May	21.57	.....	20.26	.....	21.16	.....
June	20.76	.....	19.76	.....	20.11	.....
July	20.76	.....	19.76	.....	20.26	.....
August	20.76	.....	19.76	.....	20.26	.....
September	21.04	.....	20.03	.....	20.50	.....
October	21.50	.....	20.37	.....	20.83	.....
November	22.64	.....	21.58	.....	22.08	.....
December	22.76	.....	21.76	.....	22.26	.....
Year	22.33	.....	21.26	.....	21.68	.....

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

Domestic

	1925				1926	
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Alaska shipments	5,496	3,140	4,677	2,880	3,644	2,556
Calumet & Arizona	1,840	2,117	2,070	1,682	1,737	1,795
Magma	.....	.....	.....	.....	1,208	1,095
Miami	2,088	2,052	2,090	2,112	2,228	2,109
New Cornelia	2,806	2,734	2,150	3,604	3,664	2,986
Nevada Con	9,142†	.....	.....	9,777†	.....	.....
Old Dominion	1,370	1,097	958	1,217	1,291	1,080
Phelps Dodge	6,748	6,636	6,500	6,957	7,586	6,949
Ray Con	17,541†	.....	.....	18,025†	.....	.....
United Verde Extension	1,865	1,797	1,632	1,874	1,987	1,764
Utah Copper	26,798†	.....	.....	26,723†	.....	.....
Tennessee Copper	585	596	573	604	555	503

Foreign

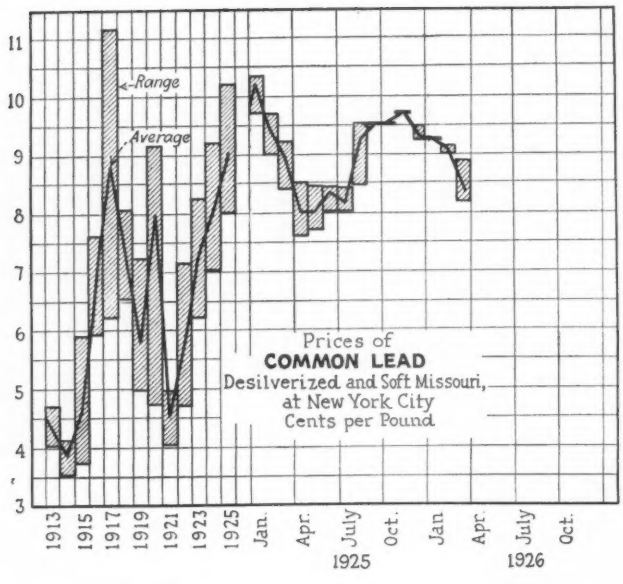
Boleo, Mexico	858	854	798	773	771	820
Furukawa, Japan	1,575	1,613	1,349	1,579	1,579	.....
Granby Cons., Canada	1,495	1,738	1,396	1,927	1,438	.....
Katanga, Africa	8,284	8,703	8,207	6,703	6,827	6,810
Mount Lyell, Aust	2,076†	.....	.....	1,805	.....	.....
Sumitomo, Japan	1,011	1,742	1,553	1,683	1,188	.....

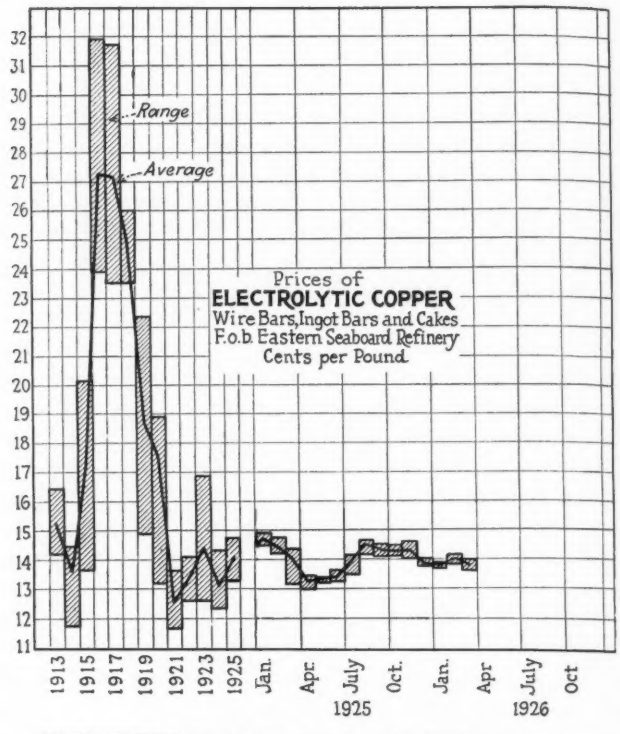
†Three months.

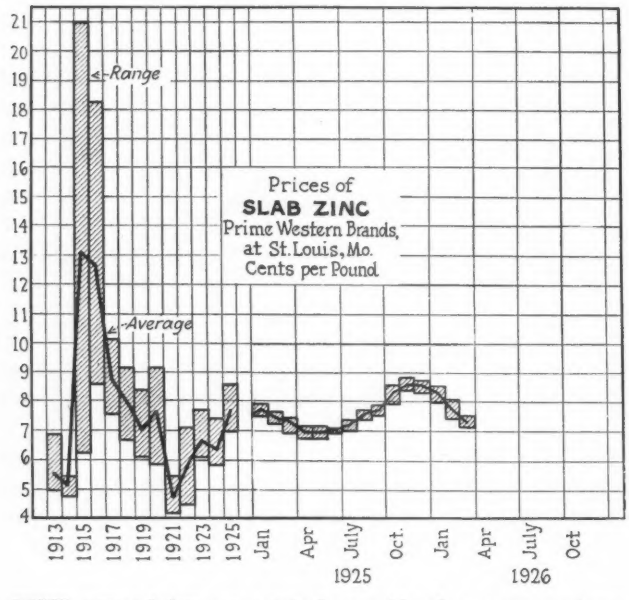
Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

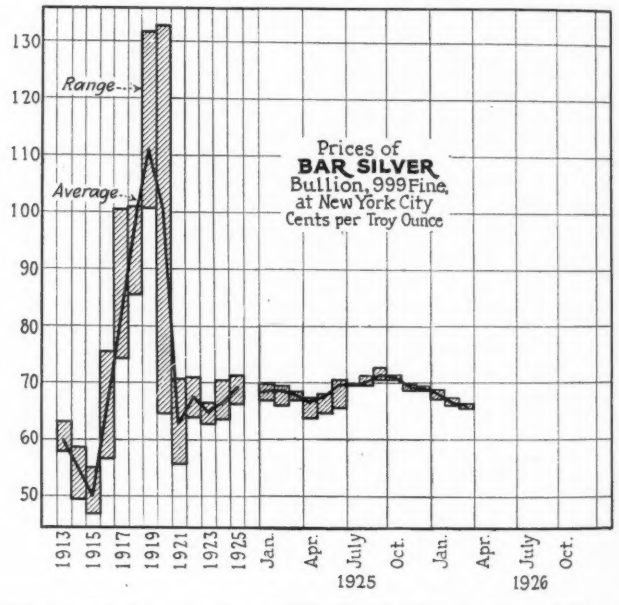
	1924		1925		1926	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	66,631	2,149	74,789	2,412	71,026	2,291
February	65,681	2,265	68,967	2,463	67,793	2,421
March	65,181	2,102	74,901	2,416	.....	.....
April	66,073	2,202	70,667	2,356	.....	.....
May	65,608	2,116	70,574	2,276	.....	.....
June	63,933	2,131	59,894	2,330	.....	.....
July	64,787	2,090	68,507	2,210	.....	.....
August	66,756	2,153	68,090	2,196	.....	.....
September	63,800	2,127	67,720	2,272	.....	.....
October	68,989	2,225	71,042	2,292	.....	.....
November	68,291	2,276	67,400	2,247	.....	.....
December	67,647	2,182	69,566	2,244	.....	.....
Total	793,377	.....	842,117	.....	138,819	.....
Monthly average	66,115	.....	70,176	.....	69,410	.....
Average of daily rate	.....	2,168	.....	2,307	.....	2,353

Metal Price Curves

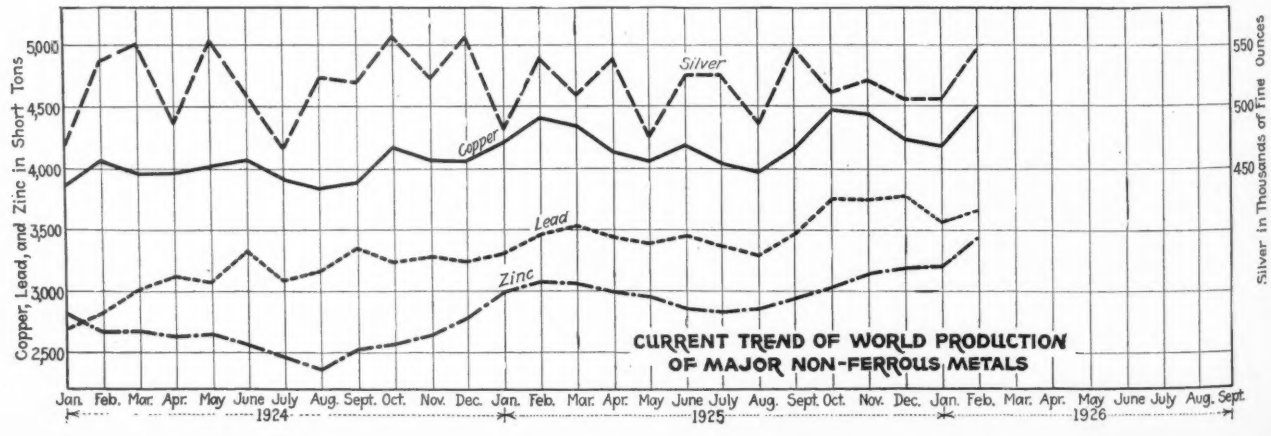



Range
Average
Prices of
ELECTROLYTIC COPPER
Wire Bars, Ingot Bars and Cakes
F.o.b. Eastern Seaboard Refinery
Cents per Pound
1913 1915 1917 1919 1921 1923 1925 Jan. Apr. July Oct. Jan. Apr. July Oct
1925 1926





THE curves below are not to be considered as permanent records of production. They show merely the current trend in terms of daily output, according to latest estimates of the American Bureau of Metal Statistics. The figures represent countries that produced in 1923 and 1924 about 97 per cent of the world's output of copper; 78.5 per cent of the lead; 87.5 per cent of the zinc; and 81 per cent of the silver.


Silver
Copper
Lead
Zinc
Copper, Lead, and Zinc in Short Tons
Silver in Thousands of Fine Ounces
CURRENT TREND OF WORLD PRODUCTION
OF MAJOR NON-FERROUS METALS
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept.
1924 1925 1926

Company Reports

Chief Consolidated Profits Cut by Plant Changes

Smelter returns of $2,441,215 and net earnings of $347,182 are reported by the Chief Consolidated Mining Co., operating in the Tintic district in Utah, for the year 1925.

The tonnage of ore mined during the last year was the largest during the life of the company; the grade was, however, slightly lower than that of the previous year, and this condition, added to the attendant unusual outlay in connection with the still further readjustments and construction work in connection with the mill plant, which it was found necessary to make, impaired the final net results, making these less than in the previous year.

Metal Contents of Ores

Gold, oz.	16,758	Copper in copper ores, lb.	1,563,183
Silver, oz.	2,751,500	Lead in zinc-lead ores, lb.	1,731,732
Lead in lead ores, lb.	20,472,275	Zinc in zinc-lead ores, lb.	2,849,612

Balance Sheet Dec. 31, 1925

Assets

Mining property		$4,268,884.08
Mine investments		1,295,256.65
Current assets		353,819.07
Walker Brothers, bankers, trustee		1,200.00
		$5,919,159.80

Liabilities

Capital stock			
1,500,000 shares at $1		$1,500,000.00	
Less shares in treasury		359,374.00	
			$1,140,626.00
First-mortgage bonds			712,500.00
Stock premium		707,216.82	
Less bond discount and expense		44,062.18	
			663,154.64
Surplus			
Dec. 31, 1924		$2,730,758.50	
Profits			
Gross receipts from sales of products	$2,718,677.77		
Less operating costs and for reserves for taxes and profit and loss items but exclusive of depletion charges	2,325,422.07		
Operating profit	393,255.70		
Interest on investments and deposits	5,770.18		
	399,025.88		
Less accrued interest on first-mortgage bonds	51,843.75		
	347,182.13		
Less dividends Nos. 41 and 42	214,192.90		
	132,989.23		
Less reserve for bond retirement	37,500.00		
		95,489.23	2,826,247.73
Current liabilities			137,743.49
Reserve accounts			
Taxes		100,002.32	
Depreciation		287,507.24	
Miscellaneous		51,378.38	
			438,887.94
			$5,919,159.80

Saint Mary's Mineral Land Co.

Cash receipts and expenditures of Saint Mary's Mineral Land Co., owning property in the Michigan copper district, during 1925 were as follows:

Receipts

Cash on hand Dec. 31, 1924		$134,424.91
Payments for wood and timber	$24,265.00	
Champion Copper Co. depletion and depreciation accounts	570,000.00	
Dividends and distributions	2,128.00	
Interest	44,507.16	
Ground rent	5,333.05	
Notes collected	200.00	
Refund federal income taxes and interest	8,965.06	
Sundry other receipts	100.00	655,498.27
Total		$789,923.18

Expenditures

Participation in demand loans	220,000.00	
Taxes and miscellaneous	29,270.56	
Salaries and expenses	26,316.79	
1925 Distribution No. 1	480,000.00	755,587.35
Cash on hand Dec. 31, 1925		$34,335.83

Vanadium Corporation of America and Subsidiary Companies

Business done by the Vanadium Corporation of America during 1925 exceeded that of any one of the preceding four years, according to the recent report. The company operates vanadium mines in Peru and Colorado; tungsten mines in Colorado; and various alloy-manufacturing works.

Consolidated Income and Surplus Accounts for Year Ended Dec. 31, 1925

Net earnings from operations (after deducting all expenses incident to operations, including those for ordinary repairs and maintenance)			$2,191,060.39
Other income			
Income from commercial interest and discount and rents			89,029.13
Total			$2,280,089.52
Income charges			
Provision for depreciation of plant, equipment and patents and depletion of mines		$419,343.19	
Provision for federal tax on income for year 1925		196,821.36	
Provision for bad debts		2,973.13	
Loss on property sold		113,807.45	
Provision for contingencies		19,414.19	
Total income charges			752,359.32
Net income for year			$1,527,730.20
Dividend appropriation of income			377,226.66
Balance to earned surplus			$1,150,503.54
Earned surplus			
Balance, Jan. 1, 1925		$1,497,712.20	
Sundry adjustments		334,282.58	1,163,429.62
Balance, being earned surplus at Dec. 31, 1925			$2,313,933.16

Calumet & Arizona Operating Net Income $2,720,318

Results of operations during 1925 of the Calumet & Arizona Mining Co., which produces copper in the Bisbee district in Arizona and is financially interested in other properties, are summarized as follows:

Profit-and-Loss Account

Income

Total earnings on metals	$8,239,479.88	
Income from dividends	845,498.11	
Interest	177,895.40	
Other income	108,975.68	
		$9,371,849.07

Expenditures

Operating expenses	$5,220,979.75	
Salaries, office and general expenses	54,213.06	
Freight, refining and marketing	860,462.89	
State and federal taxes	515,067.27	
Miscellaneous	808.02	
		6,651,530.99
		$2,720,318.08
Less		
Depreciation	$318,066.27	
Ore depletion	1,336,716.57	
		1,654,782.84
Net income		$1,065,535.24

Net current and working assets totaled $5,823,081, according to the balance sheet of Dec. 31, 1925; current liabilities were only $532,288.

Production

	Copper, Lb.	Silver, Oz.	Gold, Oz.
From domestic ores treated	42,990,817	789,978.01	35,227.750
In domestic ores sold	1,566,402	42,455.75	2,059.171
	44,557,219	832,433.76	37,286.921
From foreign ores	1,229,588	72,249.80	1,193.750
Totals	45,786,807	904,683.56	38,480.671

In addition 14,265 tons of silver lead-zinc ore was sold. The mines of the company are in excellent physical condition. Some very promising new bodies of high-grade ore have been located on the lower levels and in new territory.

Asbestos Corporation of Canada Makes Final Report

Profits of the Asbestos Corporation of Canada shown after making allowance for bond interest, government taxes, and other charges, amounted to $700,740.40 in 1925, compared with $396,355.07 in 1924. The shareholders on Dec. 18, 1925, voted unanimously to authorize the directors to sell the whole undertaking and assets of the company to a new company organized to take over various companies in the district. The deed of sale was signed on Feb. 1, 1926.

Comparative Statement of Profit and Loss and Surplus

	1924		1925
Profits from operations for the year after providing for government taxes, but before making provision for depreciation and exhaustion of minerals	$419,248.77		$781,979.33
Interest on company's investments, etc.	127,106.30		118,761.07
	$546,355.07		$900,740.40
Deduct			
Bond interest	$150,000.00	$150,000.00	
Provision for depreciation of plant	.....	75,000.00	
Provision for exhaustion of minerals	67,293.50	75,000.00	
	$217,293.50		300,000.00
	$329,061.57		$600,740.40
Deduct dividends			
On preferred stock	$240,000.00	$240,000.00	
On common stock	60,000.00	150,000.00	390,000.00
	$300,000.00		
Surplus profits for the year	$29,061.57		$210,740.40
Add			
Surplus balance from previous year	2,233,407.51		2,262,469.08
Surplus as per balance sheet	$2,262,469.08		$2,473,209.48

Record Copper Consumption in 1925

The American Bureau of Metal Statistics estimates the world consumption of copper in 1925 at 1,511,000 metric tons. This exceeds the consumption of 1918, the previous high year, by 105,900 tons. The new figure is computed on the basis of ingot and bar copper as produced in the several countries, plus imports, minus exports. It is to be remarked that these are preliminary figures, reported as nearly as possible at the present time, and that some revisions will doubtless be made later. It appears that the world's consumption of copper was about 1,511,000 metric tons in 1925, compared with the world's production of 1,440,300 tons, the delivery for consumption being thus 70,700 tons in excess of the production. The deficiency of production was made up, of course, by drawing upon accumulated stocks.

Coming Meetings of Mining Companies

The following meetings of the stockholders of mining companies have been announced to take place within the next few weeks:

Company	Books Close	Books Open	Date of Meeting
Alaska Juneau Gold	Feb. 23	.....	Apr. 6
American Smelting & Refining	Mar. 16	After meeting	Apr. 6
American Zinc, Lead & Smg	Apr. 7	Apr. 15	Apr. 14
Bethlehem Steel	Mar. 6	Apr. 7	Apr. 6
Butte & Superior	Mar. 26	.....	Apr. 16
Callahan Zinc-Lead	Mar. 22	.....	Apr. 12
Calumet & Arizona	Mar. 26	.....	Apr. 19
Calumet & Hecla	Apr. 1	After meeting	Apr. 8
Federal Mining & Smelting	Mar. 22	.....	Apr. 12
Freeport Texas	Mar. 15	After meeting	Apr. 12
Miami Copper	Apr. 1	.....	Apr. 21
National Lead	Mar. 25	Apr. 16	Apr. 15
Nevada Consolidated	Mar. 26	.....	Apr. 16
Ray Consolidated	Mar. 26	.....	Apr. 16
U. S. Steel	Mar. 12	Apr. 2	Apr. 19

Imports and Exports of Ores and Metals in February, 1925 and 1926

Compiled by the U. S. Department of Commerce

In pounds unless otherwise specified

Imports

	February, 1925	February, 1926
Antimony		
Ore { Gross weight	93,435	264,265
Ore { Antimony content	61,349	200,715
Liquated, regulus or metal	1,156,904	2,298,726
Copper		
Ores	11,710,635	3,858,785
Concentrates	4,951,704	5,005,768
Regulus, coarse metal and cement copper	.....	.....
Total	16,662,339	8,861,553
From		
Spain	1,439,715	508,398
Canada	5,016,488	736,858
Mexico	2,255,980	2,282,460
Cuba	2,625,886	2,206,400
Chile	3,463,647	2,781,243
Peru	38,577	149,645
Other countries	1,822,046	199,549
Unrefined, black, blister and converter copper in pigs, bars and other forms	35,002,965	51,879,236
From		
Spain	615,250	.....
United Kingdom	.....	727,821
Canada	4,549,942	5,858,009
Mexico	8,772,922	6,768,114
Chile	6,518,562	8,675,832
Peru	6,261,118	10,226,579
Portuguese Africa	2,464,764	15,105,188
Other countries	5,820,409	7,517,693
Refined copper	7,104,569	7,271,746
Old and clippings for remanufacture	1,442,689	495,446
Composition metal, copper chief value	11,657	10,000
Brass		
Old and clippings for remanufacture	977,439	706,001
Lead		
Ore and matte	7,699,620	10,098,386
Bullion or base bullion	11,612,384	9,065,103
Pigs and bars	2,728,800	366,547
Scrap lead, babbitt metal, solder, and other forms (lead content)	117,256	9,217
Type metal and antimonial lead { gross weight	952,156	186,054
Type metal and antimonial lead { lead content	734,844	146,841
Manganese ore tons { gross weight	.....	174
Manganese ore tons { manganese content	.....	27,239
Pyrites	41,831	26,979
Tin		
Ore, tons	2	23
Bars, blocks, pigs	13,733,710	14,561,715
From		
United Kingdom	2,163,351	5,986,345
British Malaya	8,850,253	6,666,629
China	616,083	.....
Dutch East Indies	.....	33,600
Hongkong	897,482	470,495
Australia	147,844	89,600
Other countries	1,058,697	1,315,046
Zinc		
Ore, zinc content	158,549	7,049,180
Blocks, pigs and old	4,839	.....

Exports of Copper, Lead and Zinc

	February, 1925	February, 1926
Copper		
Ores, concentrates, composition metal, and unrefined	319,746	4,000
Refined in ingots, bars and other forms	56,990,450	54,670,583
Exported to		
Belgium	4,959,912	7,431,976
France	9,294,987	10,411,003
Germany	9,900,054	5,837,864
Italy	5,481,694	4,489,734
Netherlands	11,949,909	1,640,440
Spain	246,418	1,041,668
Sweden	2,200,947	1,735,550
United Kingdom	10,748,027	18,733,812
Other Europe	202,461	168,282
Canada	1,867,855	1,566,748
Japan	89,600	951,858
Other countries	48,586	661,648
Old and scrap	1,136,852	706,918
Pipes and tubes	90,396	249,957
Plates and sheets	715,243	641,453
Rods	4,255,721	4,194,114
Wire	1,013,346	549,870
Insulated copper wire and cable	867,404	1,031,361
Lead		
In pigs, bars, etc.		
From domestic ore	1,210,358	121,753
From foreign ore	17,422,074	5,046,488
Total	18,632,432	5,168,241
Exported to		
Belgium	896,141	448,139
France	1,926,962	1,333,208
Germany	4,873,607	1,792,464
Italy	291,337	.....
Netherlands	1,568,532	.....
United Kingdom	7,573,239	1,064,849
Other Europe	672,156	280,386
Argentina	291,281	.....
Brazil	280,072	123,774
Other countries	259,105	125,421
Other lead manufactures	523,091	2,028,925
Zinc		
Ore and concentrates, tons	.....	6,404
Dross	2,982,116	2,541,871
Cast in slabs, blocks or pigs	17,432,047	2,762,522
Exported to		
Belgium	728,150	56,018
France	1,512,398	1,265,684
Germany	2,712,169	156,816
Italy	336,176	448,212
Netherlands	1,999,010	94,000
United Kingdom	7,666,258	247,455
Other Europe	559,622	280,035
British India	1,456,030	.....
Other countries	462,234	214,302
In sheets, strips, and other forms	611,841	695,677
Dust	298,163	155,321
Other zinc manufactures	63,675	152,766

Freight Rates on Metals, Ores, and Concentrates

Carload Lots

Copper Bullion and Refined Copper

From	To	Rate per Ton of 2,000 Lb. All Rail	Via Gulf
El Paso, Tex.	Baltimore, Md.	$11.40	$10.00
Garfield, Utah	Perth Amboy	12.50	.....
Garfield, Utah	San Francisco	5.85	.....
Hayden, Ariz.	Perth Amboy	14.50	12.50
Miami, Ariz.	Perth Amboy	14.50	12.50
Anaconda, Mont.	Perth Amboy	12.50	.....
Butte, Mont.	Perth Amboy	12.50	.....
Humboldt, Ariz.	Chrome, N. J.	14.50	12.50
Douglas, Ariz.	Perth Amboy	14.50	12.50
Globe, Ariz.	Perth Amboy	14.50	12.50
Clifton, Ariz.	Perth Amboy	14.50	12.50
Clarkdale, Ariz.	Chrome, N. J.	14.50	12.50
Via Southern S.S. Co. or Morgan Line		.....	$9.40

From	To	Rate per Ton of 2,000 Lb. All Rail	Via Gulf
Copperhill, Tenn.	Laurel Hill, N. Y.	$10.80	.....
Tooele, Utah	Chrome, N. J.	12.50	.....
McGill, Nev.	Baltimore, Md.	12.90	.....
Houghton, Mich.	New York	9.60	.....
Hancock, Mich.	New York	9.60	.....
Hubbell, Mich.	New York	9.60	.....
Dollar Bay, Mich.	New York	9.60	.....
Tacoma, Wash.	New York	Conference rate	$6.00
Via Canal			
Anaconda, Mont.	Tacoma, Wash.	7.09	.....
Ajo, Ariz.	New York	14.50	$12.50

Marine Freight Rates

New York to

Hamburg	$4.50 per gross ton copper and lead
Liverpool	5.50 per gross ton copper and lead
Antwerp	4.00 per gross ton copper and lead
Havre	4.75 per gross ton lead
	5.00 per gross ton copper

Gulf ports to

Hamburg	$4.50 per gross ton copper and lead
Liverpool	5.50 per gross ton copper and lead
Antwerp	4.00 per gross ton copper and lead
Havre	5.00 per gross ton copper

Pacific coast ports to

Hongkong	$6.00 per short ton copper and lead
Kobe	6.00 per short ton copper and lead

Lead Bullion (Pig Lead Where Shown)

From	Rates per Ton of 2,000 Lb. To New York	To St. Louis
East St. Louis, Ill.	$7.00	.....
Pueblo, Colo.	12.50	$9.00
Leadville, Colo.	12.50	9.00
East Helena, Mont	12.50	9.50
El Paso, Tex.	10.00 Via Gulf	
	12.00 All Rail	7.00
Omaha, Neb.	9.60	3.65
Murray, Utah	12.50	9.00
Midvale, Utah	12.50	9.00
Tooele, Utah	12.50	9.00
East Chicago, Ill.	6.40	(a) 1.60
Kellogg, Idaho	13.50	9.50
Carnegie, Pa.	3.80	(a) 5.00
Selby, Calif.	(b) 6.00	.....
Herculaneum, Mo.	(a) 8.80	(a) 1.80
Federal, Ill.	7.00	(a) 1.80
Collinsville, Ill.	7.00	(a) .75½
Granby, Mo.	(a) 10.50	(a) 3.50
Joplin, Mo.	(a) 10.50	(a) 3.50

(a) Pig lead only.
(b) Conference rate, via canal.

Slab Zinc

From	Rates per Net Ton to E.St. Louis	New York
Donora, Pa.	(a) $4.60	$3.80
Langeloth, Pa.	(a) 4.60	3.80
Palmerton, Pa.	7.10	3.00
Hillsboro, Ill.	1.40	7.00
Danville, Ill.	1.60	6.40
La Salle, Ill.	1.60	6.70
Springfield, Ill.	3.00	7.00
Cleveland, Ohio	5.80	5.00
Moundsville, W. Va.	4.40	3.80
Van Buren, Ark.	3.80	10.80
Fort Smith, Ark.	3.80	10.80
Bartlesville, Okla.	3.50	10.50
Blackwell, Okla.	3.80	10.80
Henryetta, Okla.	3.80	10.80
Sand Springs, Okla.	3.80	10.80
Cherryvale, Kan.	3.50	10.50
Black Eagle, Mont.	9.40	12.50
Park City, Utah	9.00	12.50
Amarillo, Tex.	5.80	12.80

(a) To St. Louis, Mo.

Zinc Ores and Concentrates

To	From	Rate per Net Ton
Bartlesville, Okla.	Altoona, Kan.	$2 10
	Pittsburg, Kan.	1 09
	Galena, Kan.	1 30
	Joplin, Mo.	1 40
	Iola, Kan.	1 09
	Baxter, Kan.	1 50
	Miami, Okla.	1 40
	Quapaw, Okla.	1 40
	Kansas City, Mo.	1 60
Sand Springs, Okla.	Miami, Okla.	2 20
	Quapaw, Okla.	2 20
	Galena, Kan.	1 50
	Joplin, Mo.	1 50
	Iola, Kan.	2 40
Dewar, Okla.	Cave Springs, Mo.	2 00
Kusa, Okla.	Cent City Spur, Mo.	2 00
Henryetta, Okla.	Chitwood, Mo.	2 00
	Galena, Kan.	1 50
	Iola, Kan.	2 40
	La Harpe, Kan.	2 40
La Harpe, Kan.	Mound City, Kan.	.50
	Oswego, Kan.	.50
	Parsons, Kan.	.50
Coffeyville, Kan.	Galena, Kan.	1 10
	Joplin, Mo.	1 22
Bartlesville, Okla. (a)	Baxter, Kan.	1 80
	Miami, Okla.	1 80
	Quapaw, Okla.	1 80

(a) Lead ore and concentrates.

Rates on Ores and Concentrates

From	To	Value of Product $5	$10	$15	$20	$25	$30	$35	$40	$50	$60	$70	$75	$80	$90	$100
		Rate														
Butte, Mont.	Anaconda, Mont.	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	22	.22	.22	.22
Butte, Mont.	Black Eagle, Mont. (a)	....	....	....	....	....	....	....	1.01	....	....	....	....	....	....	1.01
Great Falls, Mont.	East Helena, Mont.	....	....	1.57	....	1.76	....	1.98	....	2.43	....	....	....	....	....	2.55
Butte, Mont.	East Helena, Mont.	....	....	1.17	....	1.46	....	1.69	....	2.03	....	....	....	....	....	2.14
Paxton, Calif.	Salt Lake Smelters, Utah	....	....	....	....	....	....	....	....	*5.50	*6.00	*6.70	....	*7.40	*8.10	*8 80
Johannesburg, Calif.	Selby, Calif.	....	....	....	2.90	....	3.50	....	4.10	4.70	5.30	5.90	....	6.50	6.80	7 10
Johannesburg, Calif.	Humboldt, Ariz.	....	....	....	3.40	....	4.10	....	4.80	5.50	6.20	6.90	....	7.60	8.00	8 30
Pioche, Nev.	Humboldt, Ariz.	....	4.50(c)	7.74	....	8.55	....	9.36	....	9.99	....	....	11.25	....	....	12.42
Creede, Colo.	Durango, Colo.	....	....	3.25	3.50	3.75	4.00	....	4.25	4.75	5.25	5.75	6.05	....	....	7 10
Ouray, Colo.	Durango, Colo.	....	....	4.30	4.80	....	5.05	....	5.50	5.90	....	6.30	....	....	....	7.70
Telluride, Colo.	Durango, Colo.	....	....	....	....	....	4.30	....	5.00	5.50	6.00	6.30	....	6.60	7.10	7.70
Silverton, Colo.	Durango, Colo.	....	....	1.40	1.40	....	....	2.20	....	....	....	....	....	2.30	2.55	2 80
Tyrone, N. M.	Douglas, Ariz.	....	....	1.60	1 90	....	2.20	....	2.50	2 80	....	....	3 10	....	....	3 40
Tyrone, N. M.	El Paso, Tex.	....	....	1.60	1 90	....	2.20	....	2.50	2 80	....	....	3.10	....	....	3.40
Lordsburg, N. M.	Douglas, Ariz.	....	1.00	1.30	1 60	....	1.90	....	2.20	2 50	....	....	2.80	....	....	3.40
Lordsburg, N. M.	El Paso, Tex.	....	1.00	1.30	1.60	....	1.90	....	2.20	2.50	....	....	2.80	....	....	3.40
Tombstone, Ariz.	Douglas, Ariz.	....	....	.60	....	.90	....	....	....	1.30	....	....	1.60	....	....	1.90
Tombstone, Ariz.	El Paso, Tex.	....	1.60	1.90	....	2.50	....	....	....	3.80	....	....	4.40	....	....	4.40
Silver City, N. M.	Douglas, Ariz.	....	....	2.48	....	3.15	....	....	....	3.83	....	....	....	....	....	5.29
Ray Junction, Ariz.	Hayden, Ariz.	....	.10	....	.40	....	.50	....	.80	.90	....	....	1.00	....	....	1.10
Sandon, B. C. / Alamo Concentrator, B. C.	Tadanac, B. C.	1.50	1.60	1.70	1.90	2.00	2.50	....	2.60	2.90	3.40	3.50	....	3.70	3.80	3.90
Rossland, B. C.	Tadanac, B. C.	.90	.90	1.00	1.00	1.10	1.50	....	1.60	1.60	1.60	1.70	....	1.70	1.70	1.70
Rossland, B. C.	Tadanac, B. C.(d)	.30	.30	.30	.30	.50	.70	....	.80	.80	....	....	....	....	....	....
Republic, Wash.	Tadanac, B. C.	....	2.11	2.56	2.66	2.86	3.84	....	3.84	3.84	4.69	4.89	....	5.19	5.39	5.59

(a) Minimum tonnage of 200 tons per day. (b) In open cars, minimum 80,000 lb. (c) Siliceous ore tailing.
(d) Applicable on ore, only when shipped in trainload lots of not less than 10 cars and exclusive of switching charges at Rossland.

From	To	Value of Ores and Concentrates $10	$15	$20	$25	$30	$35	$40	$50	$60	$70	$75	$80	$90	$100
		Rate													
Burke, Idaho (a) (d)	Bradley, Idaho	....	....	....	....	....	....	....	....	.68	....	.....	....	....	1 02
Burke and Wallace, Idaho	East Helena, Mont.	....	....	....	....	3.00	....	3.25	3.50	3.75	4.00	.....	4.25	4.50	4 75
Sagel, Idaho	East Helena, Mont.	....	....	....	3.38	....	3.83	....	4.16	....	....	.....	....	.....	4.84
Arizona Tunnel, Idaho	Bradley, Idaho	....	....	....	....	....	....	....	....	.35	....	.....	....	.....	.50
Bayview, Idaho	Bradley, Idaho	....	....	....	....	....	....	....	3.75	....	....	4.37½	....	.....	5.12
Park City, Utah	Salt Lake Smelters	1.00(e)	1.10	1.25	....	1.50	....	1.75	....	2.00	....	.....	2.25	.....	2.50½
Eureka, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Tintic, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
St. Johns, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Ophir, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Bingham, Utah	Garfield, Utah	....	.40	....	.75	....	....	....	.95	....	....	1.10	....	....	1.25
Cherry Creek, Nev.	Garfield, Utah (c)	....	....	4.60	....	5.10	....	5.60	6.10	6.60	7.10	.....	7.60	8.10	8.60
Cherry Creek, Nev.	Garfield, Utah (b)	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	....	....
Goldfield, Nev.	Salt Lake Smelters	....	4.15	5.10	....	5.80	....	6.50	7.20	7.90	8.60	.....	9.30	10.00	10 70
Battle Mountain(a)	Salt Lake Smelters	....	....	*3.20	....	*3.80	....	*4.40	*5.00	*5.60	*6.20	.....	*6.80	*7.40	*8.00
Palisade, Nev. (a)	Salt Lake Smelters	....	2.90	3.20	....	3.80	....	4.30	4.80	5.30	5.80	.....	6.30	6.80	7 30
Mina, Nev. (a)	Salt Lake Smelters	....	....	3.60	....	4.30	....	5.00	5.70	6.40	7.10	.....	7.80	8.50	9 20
Lovelock, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8 80
Golconda, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8.80
Hazen, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8 80
Tonopah, Nev.	Salt Lake Smelters	....	4.15	5.10	....	5.80	....	6 50	7.20	7.90	8.60	.....	9.30	10.00	10 70
Rogerson, Idaho	Salt Lake Smelters	3.00	....	3.50	....	4.00	....	4.50	5.00	5.50	6.00	.....	6.50	7.00	7 07
Georgetown, Colo.	Leadville, Colo.	....	....	3.50	....	3.75	....	4.00	5.00	5.00	5.80	.....	5.80	5.80	5.85

(a) Minimum weight, marked capacity of car used, but not less than 80,000 lb. (b) Minimum weight, 80,000 lb. (c) Minimum weight, 40,000 lb.
(d) Crude ore for concentration, 30c. per ton.
(e) For $9 value rate is 95c.; $8 values, 90c.; $7 value, 85c.; $6 value, 80c.
*Indicates a change of tariff since Sept. 12.

Mining Stocks—Week Ended March 27, 1926

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Anaconda	New York	45¼	43	43½	Ap.17, My.24 0.75
Arcadian Consol.	Boston	*45	*30	*30	
Ariz. Com'l	Boston	10⅜	10	10⅜	Jy.21, Jy. 31 SA 0.50
Calaveras	N. Y. Curb	2⅜	2⅛	2⅛	
Calumet & Arizona	New York	57⅞	55½	56½	Mr.5, Mr.21 QX 1.50
Calumet & Hecla	Boston	14⅜	13¾	14	Nov 30, De.15 Q 0.50
Cerro de Pasco	New York	63½	61	61	Ja. 14, Fe. 1, Q 1.00
Chile Copper	New York	34	32½	33	Ma.3, Ma.29, Q 0.62½
Chino	New York			18	Sept., 1920 0.37½
Con. Coppermines	N. Y. Curb	1⅞	1⅝	1⅝	
Copper Range	Boston	17	15⅞	16½	May, 1925 1.00
Crystal Copper	Boston Curb	*53	*45	*45	
East Butte	Boston	3½	3½	3½	Dec., 1919 0.50
First National	Boston Curb			*15	Feb., 1919 0.15
Franklin	Boston	*50	*50	*50	
Granby Consol	New York	19	18	18	May, 1919 1.25
Greene-Cananea	New York	10⅝	10½	10½	Nov., 1920 0.50
Hancock	Boston	*80	*80	*80	
HoweSound.new,r.t.c.	New York	35	33⅜	33½	Ap.1, Ap.15 0.75
Inspiration Consl.	New York	23⅛	21⅞	22	Mar.18, Ap.5, Q 0.50
Iron Cap	Boston Curb	3⅜	3⅛	3⅛	May, 1923 0.15
Isle Royale	Boston	11⅛	10⅛	10⅜	No.30, De.5 1.00
Jerome Verde Dev	N. Y. Curb	*100	*81	*100	
Kennecott	New York	53⅛	51⅛	51⅛	Ma.5, Ap.15 Q 1.00
Lake Copper	Boston	1½	1 1/16	1 1/16	June, 1925 0.50
Magma Copper	New York	41	39⅛	39⅛	Mh.31, Ap.15, Q 0.75
Mason Valley	N. Y. Curb	2⅛	2	2	
Mass Consolidated	Boston	*25	*25	*25	Nov., 1917 1.00
Miami Copper	New York	12⅛	11⅝	12	Feb.1, Feb.15 Q 0.25
Mohawk	Boston	32	30½	31⅛	Jan. 30, Ma.1 Q 1.00
Mother Lode Coa.	New York	6⅞	6⅛	6⅛	De. 11, De. 31 0.37½
Nevada Consol	New York	13	12	12	Mh.18, Mh.31 Q 0.25
New Cornelia	Boston	20⅛	19⅛	19⅛	Fe.5, Fe.23 Q 0.30
North Butte	Boston	2⅜	2⅛	2⅛	Oct., 1918 0.25
Ohio Copper	N. Y. Curb	*63	*52	*55	No. 14, De. 2 0.05
Old Dominion	Boston	17	16	16	Dec., 1918 1.00
Phelps Dodge	Open Mar.	†128	†122	..	Mar.20, Apr.20 Q 1.00
Quincy	Boston	21⅛	19	18⅛	Mar., 1920 1.00
Ray Consolidated	New York	11⅞	11⅛	11⅛	Dec., 1920 0.25
Ray Hercules	N. Y. Curb			11⅞	
St. Mary's Min. Ld.	Boston	33½	30	31	May, 1925 3.00
Seneca Copper	New York	6⅜	6	6	
Shannon	Boston	*50	*50	*50	Nov., 1917 0.25
Superior & Boston	Boston	*80	*50	*80	
Tenn. C. & C.	New York	13	12⅛	12⅛	Fe.27, Ma.15, Q 0.25
United Verde Ex.	N. Y. Curb	28⅛	27⅛	28⅛	Ap.6, My.1, Q 0.75
Utah Copper	New York			96	Mh.18, Mh.31, Q 1.25
Utah Metal & T	Boston	1⅛	1⅛	1 7/16	Dec., 1917 0.30
Victoria	Boston	*60	*50	*50	
Walker Mining	Salt Lake	1.15	1.10	1.10	
NICKEL-COPPER					
Internat. Nickel	New York	36⅛	34⅜	34⅛	Ma.11, Ma.31, Q 0.50
Internat. Nickel, pfd.	New York	102½	102¼	102¼	Ja.25, Fe.1, Q 1.50
LEAD					
Gladstone M. M. Co.	Spokane	*37	*35½	*35½	Ja. 1, Ja. 10 M 0.01½
National Lead	New York	151	144½	148	Ma.12, Ma.31 Q 2.00
National Lead pfd.	New York	116½	116	116½	Aug.21, Se.15 1.75
St. Joseph Lead	New York	41½	39½	40	De.10, De.20 QX 1.50
ZINC					
Am. Z. L. & S	New York	8⅜	7⅜	7⅜	May., 1920 1.00
Am. Z. L. & S, pfd.	New York	32	30	30	Nov., 1920 1.50
Butte C. & Z.	New York	5⅛	5	5	De.10, De.24 0.50
Butte & Superior	New York	13⅛	12⅛	12⅛	Ma.15, Ma.31 Q 0.50
Callahan Zn-Ld	New York	2	1⅛	1⅛	Dec., 1920 0.50
Eagle Picher	Cincinnati	30	28⅝	28⅝	My. 15, Jn.1 0.40
Eagle Picher, pfd.	Cincinnati			110	Mh.31, Ap.15 Q 1.50
New Jersey Zn	N. Y. Curb			208	Fe.10, Fe.28 Q 0.90
United Zinc	N. Y. Curb			*70	
Yellow Pine	Los Angeles			*36	De.8, De.18 Q 0.04
GOLD					
Alaska Juneau	New York	1⅛	1⅛	1⅛	
Argonaut	Toronto	*32	*29½	*30½	
Barry-Hollinger	Toronto	*43	*34	*42½	
Carson Hill	Boston			*35	
Consol. W. Dome L.	Toronto	*20½	*18½	*18½	
Cresson Consol. G.	N. Y. Curb	2⅜	2⅜	2⅜	Mh.31, Ap.10 0.10
Crown Reserve	Toronto	*18½	*14	*18	Jan., 1917 0.05
Dome Mines	New York	18⅜	15½	15⅜	Mh.31, Ap.20, Q 0.50
Golden Center	N. Y. Curb	1⅛	1⅛	1⅛	
Golden Cycle	Colo. Springs	†1.52	†1.49	....	No. 30, Dec.10 Q 0.03
Hollinger Consol.	Toronto	18.75	18.40	18.50	Ma. 9, Ma. 25 0.08
Homestake Mining	New York	53½	53⅛	53⅛	Ma.20, Ma.25 M 0.50
Kirkland Lake	Toronto	1.02	*92	1.00	
Lake Shore	Toronto	10.50	10 05	10.40	Ma.1, Ma.15 Q 0.10
McIntyre-Porcupine	New York	24⅛	23⅛	23⅜	Fe.1, Ma.7 0.05
Newray	Toronto	*35½	*34½	*34½	
Night Hawk Pen.	Toronto	*7½	*6½	*6½	
Noranda	N. Y. Curb	13	12⅛	12⅝	
Portland	Colo. Springs	†*60	†*55	....	Oct., 1920 0.01
Rand Mines	New York	....	....	34⅜	Fe.16, Fe.26 1.52
Teck-Hughes	Toronto	3.05	2.81	2.94	Ja. 15, Fe. 1 0.05
Tom Reed	Los Angeles			*73	Ma.10 Ma.20 0.02½
Tough-Oakes	Toronto	*50½	*45	*46½	
United Eastern	N. Y. Curb	*45	*45	*45	July, 1924 0.05
Vipond Cons	Toronto	1.60	1.52	1.56	
Wright-Hargreaves	Toronto	8.40	8.01	8.05	Mh.15, Ap.1 1 QX 0.07½
Yukon-Alaska Trust	N. Y. Curb	21½	21	21½	
GOLD AND SILVER					
Carnegie Metals	Pittsburgh	18½	19	18	
Con. Cortez	N. Y. Curb	*7	*7	*7	
Con. Virginia	San Francisco			*11½	
Continental Mines	N. Y. Curb			*45	
Dolores Esperanza	N. Y. Curb	*52	*50	*52	July, 1923 0.05
Premier Gold	N. Y. Curb	2⅛	2⅛	2⅛	Mh.19, Apr.3 Q 0.08
Tonopah Belmont	N. Y. Curb	3½	3½	3½	Se.15, Oc.1 0.05
Tonopah Extension	N. Y. Curb	*79	*72	*72	Apr. 1925 0.05
Tonopah Mining	N. Y. Curb	6½	5½	5⅝	Ap.7, Ap.21 Q 0.07½
Unity Gold	N. Y. Curb			*20	
West End Consol	N. Y. Curb			*25	Mar., 1923 0.05
Yukon Gold	N. Y. Curb			*45	June, 1918 0.02

Stock	Exch.	High	Low	Last	Last Div.
SILVER					
Alvarado	N. Y. Curb	1	1	1	Oct., 1920 0.50
Beaver Consol	Toronto	*70	*63	*69½	May. 1920 0.03
Castle-Trethewey	Toronto	1.63	1.45	1.56	
Coniagas	Toronto	4.15	4.00	4.00	May, 1924 0.12½
Keeley	Toronto	1.61	1.51	1.55	Ma 1, Ma.15 X 0.12
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Ap.1, Ap.15 0.12½
La Rose	Toronto	*16⅜	*15	*15½	Apr., 1922 0.10½
Lorrain Trout Lake	Toronto	*93	*90	*90	Jy. 2, Jy. 15 0.05
McKinley-Dar.-Sav	Toronto	*20	*18	*18½	Oct., 1920 0.03
Mining Corp. Can	Toronto	3.80	3.60	3.61	Ja. 16, Ja.30 0.12½
Nipissing	N. Y. Curb	6¼	5⅞	6¼	Mh.31, Ap.20, Q 0.15
Temiskaming	Toronto	*12	*11	*11	Jan., 1920 0.40
SILVER-LEAD					
Ahumada	New York	8⅛	7⅜	7⅜	Mh.8, Ap.5, Q X 0.25
Alta Merger	Salt Lake	†3	†1	....	
Bingham Mines	Boston	50¼	46½	46½	Ma.20, Ma.31 Q 1.00
Cardiff M. & M.	Salt Lake			*55	De.16, No.18 0.10
Chief Consol	Salt Lake	3.30	3.30	3.30	Fe. 1, 0.10
Emma Silver	Salt Lake	†1⅞	†⅞	....	
Erupcion	Boston Curb	1⅛	1⅛	1 1/16	Mh.18, Ap.5, X 0.10
Federal M. & S.	New York	85	80	80	
Federal M. & S., pfd.	New York	74	70	70	No.25, De.15 Q 1.75
Hawthorne Mines	N. Y. Curb	*21	*19	*20	
Hecla Mining	N. Y. Curb	17⅞	17⅛	17⅛	Fe.15, Ma.15 Q 0.50
Iron King Mining	Salt Lake			39	
Keystone Mining	Salt Lake	*51	*50	*51	Au.12, Au.26 0.07½
Lucky Jim	Spokane	*17	*15½	*15½	
Mammoth Mining	Salt Lake	2.80	2.80	2.80	De. 16, De. 23 0.10
Marsh Mines	Spokane	*5⅜	*4	*4	Se.15, Oc.1 0.15
Ontario Silver	New York			10	
Park Utah	Salt Lake	7.10	7.00	7.00	Mh.15, Ap.1 0.15
Prince Cons	Salt Lake	*5⅜	*4½	*4½	
Silver King Coal	Salt Lake	8.25	8.00	8.20	Mh.20, Ap.1, Q 0.25
Silversmith	Spokane	*47½	*46½	*47½	De.31, Ja.10 0.02
Tamarack-Custer	Spokane	*60	*47	*47	Sept., 1924 0.25
Tintic Standard	Salt Lake	13.00	12.25	13.00	Mh.1, Mh.20, QX 0.40
Utah-Apex	Boston	9½	9	9⅜	Ja.1, Ja.5, Q 0.35
Western Utah Copper	N. Y. Curb			*8	
IRON					
Bethlehem Steel	New York	43½	41	41½	July, 1924 1.25
Colorado Fuel & Iron	New York	32¼	29⅞	30	May, 1921 0.75
Gt. North'n Iron Ore	New York	25⅛	24	24	De. 4, De. 28. 0.75
Inland Steel	New York	39	39	39	Fe.15, Ma.1 Q 0.62½
Mesabi Iron	N. Y. Curb	1⅛	1⅛	1⅛	
Replogle Steel	New York	11⅛	10¼	10¼	
Republic I. & S.	New York	55⅞	49½	49⅞	May, 1921 1.50
Republic I. & S. pfd.	New York	93½	92½	93⅜	Ma.15, Ap.1, Q 1.75
Sloss-Sheffield S. & I.	New York	112½	106½	107½	Ma.10, Ma.20 Q 1.50
Sloss-Shef. S.&I. pfd.	New York	102	102	102	Ma.20, Ap.1, Q 1.75
U. S. Steel	New York	125½	120½	121⅛	Fe.27, Ma.30 XQ 1.75
U. S. Steel pfd	New York	125⅞	125⅛	125⅞	Fe. 3, Fe. 27, Q 1.75
Virginia I. C. & C.	New York	49⅛	46½	49⅛	Jan., 1924 1.50
Virginia I.C.&C.pfd	New York	...	...	73⅛	De.15, Ja.2, 2.50
VANADIUM					
Vanadium Corp.	New York	31⅛	30¼	30⅜	Fe.1, Fe.15, Q 0.50
ASBESTOS					
Asbestos Corp.	Montreal	91	90	90	De.31, Ja.15 Q 1.50
Asbestos Corp., pfd.	Montreal	114	114	114	De.31, Ja.15, Q 1.50
SULPHUR					
Freeport Texas	New York	25	22½	23⅜	Nov., 1919 1.00
Texas Gulf	New York	133⅜	127⅛	128	Ma.1, Ma.15, Q 2.50
DIAMONDS					
De Beers Consol.	New York	28⅝	28½	28½	Ja.26, Fe.2 0.23
PLATINUM					
So. Am. Gold & P.	N. Y. Curb	4⅛	4⅛	4⅛	
MINING, SMELTING, REFINING AND GENERAL					
Amer. Metal	New York	51⅞	50	50½	Fe.18, Ma.1, Q 1.00
Amer. Metal pfd.	New York	115	115	115	Fe. 19, Ma.1, Q 1.75
Amer. Sm. & Ref.	New York	124½	117½	118¼	Ja.15, Fe.1, 1.75
Amer. Sm.&Ref.pfd.	New York	114	113½	113½	Fe.5, Ma.1, Q 1.75
Consol. M. & S.	N. Y. Curb	...	...	208	De.31, Ja.15 0.75
Federated Metals	N. Y. Curb	18	18	18	
Newmont Mining	N. Y. Curb	...	...	52	Mar.31, Apr.15 Q 0.60
Southwest Metals	N. Y. Curb	...	...	2	
U. S. Sm. R. & M.	New York	43	40½	42⅜	Ja.1, Ja.7, Q 0.87½
U.S. Sm. R.&M.pfd.	New York	48⅜	48⅜	48⅜	Ja.1, Ja.7, Q 0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Henry Sachs, Colorado Springs, Colo.

PRICE WEEK ENDED MARCH 9, 1926

Name	High	Low	Last	Last Dividend Date	Amount
Aramayo Mines (25 frs.)	84/3	80/—	80/—	Feb. 1926	5 p.c.†
British Platinum (£1)	6/—	5/—	5/9	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	16/6	16/—	16/1½	Feb. 1926	6 annas*
Bwana M'Kubwa (5s)	7/—	6/4½	6/9		
Camp Bird (£1)	6/—	5/3	5/7½		
El Oro (£1)	6/7½	6/3	6/6	Nov. 1924	2½ p.c.*
Esperanza (10s)	2/—	1/6	1/9		
Frontino & Bolivia (£1)	8/6	8/—	8/6	Jan. 1926	1½ p.c.
Mexican Corpn. (£1)	19/10½	19/3	19/9		
Mexico Mines of El Oro (£1)	35/—	31/3	33/9	Dec. 1925	12½ p.c.*
Oroville Dredgng (£1)	4/—	3/6	4/—	Dec. 1923	3½ p.c.
Ouro Preto (£1)	2/6	2/—	2/6	May 1925	2½ p.c.
St. John del Rey (£1)	10/9	9/9	10/—	May 1925	6½ p.c.
San Francisco Mines (10s)	29/6	28/9	29/3	Jan. 1926	22½ p.c.
Santa Gertrudis (£1)	21/6	20/1½	21/3	July 1920	5 p.c.
Selukwe (2s. 6d.)	10/3	9/1½	10/3	April 1917	6¼ p.c.
S. Amer. Copper (2s.)	6/—	4/9	5/9	Nov. 1917	75 p.c.
Tanganyika (£1)	46/9	42/3	44/4½	Sept. 1925	5 p.c.
Tomboy (£1)	3/6	3/—	3/3	Jan. 1926	5 p.c.
Union Miniere du Haut-Katanga (Brussels)	6.285	6.010	6.050	July 1925	150 frs.‡

* Free of British income tax. † Swiss frs. ‡ Belgian frs.